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ANCIENT MINERALOGY:

OR,

AN INQUIRY RESPECTING

MINERAL SUBSTANCES

MENTIONED BY

THE ANCIENTS:

WITH

OCCASIONAL REMARKS

ON

THE USES TO WHICH THEY WERE APPLIED.

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PREFACE.

THE author is aware that in venturing upon a scientific theme he transcends the limits of his province, but relies for indulgence on the fact, that his subject is considered chiefly in the light in which it presents itself in the writings of those ancients whom it is his proper business to interpret. It is, moreover, possible for one who makes no pretension to original discovery; who, far from being a proficient, is himself a learner; to collect from various quarters, and arrange, what may contribute to the entertainment or instruction of others, who want leisure or opportunity for similar pursuits. And if, in the performance of this task, he occasionally fail, he may reasonably hope to find in those, whom superior knowledge qualifies to aid him, not severe censors, but indulgent friends. As such, then, does the author look to the learned and scientific, for benevolent suggestions, that may enable him, perhaps, at some future time, to render this, now very imperfect essay, somewhat less unworthy their regard.

ANCIENT MINERALOGY.

One who professes his intention to treat of Ancient Mineralogy, may well anticipate some objection to the term; and that it will, perhaps, be asked: "What is meant by *Ancient Mineralogy?*" Mineralogy is a science with which the *ancients* were wholly unacquainted—and certainly they were so, if we understand, what the term now implies—a well digested classification, and systematic arrangement of every known substance in the mineral world. But, in regard as well to Mineralogy, as to Botany, Chemistry, and other branches of Natural Science, it will hardly be denied that the ancients possessed much and various information; although, on the other hand, it may be granted, that they had little *science* according to the modern acceptation of the term. Aristotle was a good zoologist, and Theophrastus a good botanist and mineralogist, notwithstanding their ignorance of modern systems; and they fail to obtain, in these characters, the credit they deserve, because the facts known to them from ob-

servation and experience were not systematically connected, and completed by the addition of others, derived from analogical reasoning, further experiment, and just induction.

Mineralogy now claims, with justice, to be regarded as a science; and, in fact, as one of the three grand divisions of Natural History, it holds an elevated rank; all inorganic bodies, the whole mineral kingdom, belonging to its domain.

In accumulating the varied objects of his science, the mineralogist has explored almost every region of the globe: the recesses of every cavern, the depths of every mine, the heart of every rock into which modern enterprise has pierced. The profusion of minerals thus brought to light has been submitted to analysis; and their true composition, as ascertained by the result, has furnished the basis generally adopted for their scientific arrangement. Some writers, however, have been much guided in their classification of minerals by external or physical characters collectively considered; and others, again, have regarded especially that most remarkable and constant of these physical characters, their crystalline form.

In the writings of the ancients we should look in vain for any such well grounded comprehensive system. They were, for the most part, content with describing individually the minerals they knew, by some more striking external characters, or some obvious property, or the uses to which they were applied. And in this branch of Natural

Science, as well as in others, there is often great difficulty in ascertaining to what species objects mentioned by the ancients are to be referred; because they were apt to dwell upon features, striking perhaps in the individual before them; but in no wise characteristic of its kind. And they were, besides, so poetical, often, and imaginative, that they could hardly bring themselves to give a plain unvarnished description of any thing remarkable, whether in nature or in art.[1]

But, in justice to the ancients we should bear in mind, that the *science* of mineralogy is, even now, of very recent date. That it is, perhaps, within the last half century only that any work has appeared containing more philosophical views of the subject than were exhibited in the little treatise of Theophrastus above two thousand years ago. We know that the ancients were acquainted with the external characters, at least, of a vast number of minerals; with the uses and properties of very many; and we find the only two ancient authors, who treat of them professedly, making various attempts at classification. Why, then, may we not speak of ancient mineralogy as well

[1] Every page of Pliny's great work, though one in which we might least expect to meet with poetry, will supply examples. Speaking, for instance, of the mysterious virtue of the magnet, he exclaims—"What is more sluggish than the rigid stone? Lo! nature hath given to it hands and feeling. What more stubborn than the obdurate iron? But it yields, and becomes gentle; for, attracted by the magnetic stone, that substance which is the subduer of all things else, flies toward the unseen power, and when near, stands still, is held and clings to its embrace," (36. 25.)

as of the mineralogy of the last century? If we should light in Pompeii on a cabinet of minerals; which would be one of Pliny's time; it might be found, perhaps, full as well arranged as was that of Sir John Hill, the translator of Theophrastus, sixty years ago.

Besides the descriptions given by Dioscorides[1] of many mineral substances, which form an important portion of his materia medica, and the incidental notices of them scattered through the Physicians, Philosophers, Historians, Geographers and Poets of antiquity, there remains a short treatise of Theophrastus, expressly "Upon stones,"—and the last five books of Pliny's great work are chiefly devoted to the consideration of minerals.

The little book of Theophrastus appears to have formed part of some larger work; in which he may, perhaps, have treated more fully of the characters and properties of minerals. In the piece which has survived to us, his chief endeavor seems to be, the settlement of some principle of classification; and, though he introduces a considerable number of mineral substances, it is often rather by way of illustration than with a view to characterize and describe them; and he evidently refers to them in most cases as to substances with which his reader is acquainted.

Beckmann pronounces Theophrastus "the ablest and most accurate mineralogist of the ancients,"[2]

[1] Whom Beckmann (Hist. of Inv. 3. 73.) pronounces a good judge of minerals.

[2] History of Inventions, 1, 142.

thus doing justice to the philosophical character of his work, and admitting that the ancients possessed such an acquaintance with minerals as might be styled *mineralogy*. Throughout the work of Theophrastus we can perceive that he is striving in a very philosophical spirit to lay down some satisfactory basis of arrangement; but the appropriate crystalline forms of minerals not having been attended to, except in some few instances, and their chemical composition being totally unknown, his efforts are, of course, not entirely successful. If we view in this light Theophrastus' work, and bear in mind that it was not his intention to describe, nor even to name all the then known minerals, we shall less wonder at its brevity, and at the slight and merely passing notice he bestows on some of the most important substances.

That those he mentions constitute but a small portion of those known to his contemporaries we may infer from the fact, that Pliny, though he draws from Grecian authors chiefly, many of them coeval with or older than Theophrastus, and though he mentions at least twenty minerals for each one named by Theophrastus, concludes by saying that there is no end to the names of these mineral productions, and that it is far from his intention to discourse of all.[1]

Theophrastus distinguishes minerals according as they are capable of *effecting*, liable or not liable, to *suffer* something. Thus the emerald, he

[1] Plin. Hist. Nat. 35, 1—37, 74, 75.

observes, can impart its color to the water in which it is immersed; the Heraclian stone possesses an attractive power. Some stones may be carved, or turned in a lathe, or divided by a saw; while upon some, steel makes no impression, and others it touches with great difficulty. Sometimes the same character, as to color, hardness, and other properties, belongs to masses of considerable extent; as to the quarries of Paros, Pentelicus, Chios, and Thebes. Other properties, again, belong to minerals which occur rarely and of small size; as the emerald, the sard, the carbuncle, the sapphire, and generally, those which are engraved as seals. He also divides minerals into fusible and infusible, combustible and incombustible, and suggests various examples to illustrate these distinctions.

Pliny handles his subject in a much less philosophical way, though far more extensively than Theophrastus. In the rambling discursive manner which characterizes throughout his valuable, but ill-digested compilation, he treats of metals in two books, the 33d and 34th; of earths in the 35th; of stones in the 36th; and in the 37th and last, of gems. Under which last division would have fallen, probably, most of the specimens that are found in modern cabinets.

Pliny observes[1] that new gems, which are without name, occur from time to time. A remark that might have been made with truth at any period of the world, if by the word gem we

[1] Plin. 37, 74.

understand, as Pliny did, a hard mineral substance, whether crystallized or not, occurring in small quantity, and fit to be engraved for ring-stones. Every year, almost, brings to light new mineral combinations, or new varieties of minerals already known. And we find that almost every province of considerable extent possesses minerals peculiar to itself. With many of these, no doubt, the ancients were unacquainted; but, on the other hand, they must have known many which modern mineralogists do not; the localities whence they were obtained having been long since exhausted, and no specimens having survived through such a lapse of time. Ancient cabinets may have contained full as great a variety as we see in modern collections; for Pliny, after specifying a great number of minerals, gives us to understand that they form but a small portion of those he could have named. The remark he adds might be made with equal truth of modern catalogues of minerals; that the same substance is often called by different names, in consequence of slight difference in some external characters.

Besides Theophrastus, Dioscorides, and Pliny, there are many ancient authors from whom occasionally something may be learned respecting minerals. Historians and geographers find occasion to speak of them as occurring in countries they describe. Physicians prescribe them as remediate. Vitruvius mentions a considerable number as used in the construction or decoration

of buildings. There are, moreover, works both prose and verse that treat expressly of minerals, and might, not improperly, be styled ancient; but which, falling below the age of Pliny, are without the limits to which we have chosen to confine ourselves.

One of the most remarkable pieces transmitted to us from antiquity, connected with our subject, is a poem consisting of near eight hundred Greek hexameters, bearing the name of Orpheus as its author, and in fact regarded not very long ago, even by learned critics, as the production of that bard so celebrated in Grecian fable; but the severity of modern criticism has disallowed its claim to such high antiquity, and left us in great uncertainty both as to its *date* and *author*. Its chief object is to teach the mystical and healing virtues of about thirty different precious stones, or mineral substances; and due allowance being made for the poetical ornaments of thought and diction with which the subject matter is invested, it is treated in much the same way as by Pliny and other ancient naturalists. That is to say, together with some obvious characters, and true properties of the mineral described, we have idle fancies and superstitious notions as to its virtues in the cure or prevention of disorders; in guarding against or healing the bite of serpents; in averting misfortune, propitiating the favor of the gods, and conciliating the good will of men. This being a too common character of ancient works on natural science,

the belles lettres scholar, unable amidst so much that is false or frivolous, to discern the truths which sometimes lie hid under various disguises, often throws aside with disgust a volume in which the *scientific* reader may detect curious and useful facts.

It is proposed to make Pliny the basis of the following remarks, and, without confining ourselves very closely to his order, to combine in a sort of commentary upon the mineralogical portion of his last five books, whatever in Theophrastus, Dioscorides, and others, shall appear to deserve notice, as connected with our subject.

But before we enter on this more methodical examination of minerals known to Pliny, at a period comparatively recent, let us consider briefly and apart, those mentioned in the Bible.

The design of the sacred Scriptures, was not to teach us Natural Science; but to make us wise unto salvation. Accordingly, and in consistence with the simplicity of those early times to which the books of the Old Testament relate, we find in them few indications of any acquaintance with minerals, other than six metals, and various precious stones.

Besides these, indeed, the mineral substances mentioned in the Bible amount in number to no more than nine; which are marble, alabaster, lime, flint, brimstone, amber, vermilion, nitre, and salt. To these we should perhaps add two others, the one *bdellium ;* mention of which

twice occurs;[1] and as to the nature of which interpreters are wholly at a loss:[2] the other *bitumen;* for a word in the sixteenth chapter of Genesis, translated *pitch*, and twice afterwards, in the same book, *slime*, is thought by the learned to signify, not the *vegetable* substance, but *mineral* pitch, a species of bitumen.

The only metals spoken of in Scripture as known previous to the Deluge, are copper and iron. Besides which we find mentioned in the Bible, gold, silver, tin and lead. Ores of two other metals appear to have been employed as pigments from the earliest times; the one a sulphuret of mercury, which furnished a native vermilion; the other a sulphuret of antimony, from which was prepared a black paint, very generally used by women in the East, even at this day, to improve the beauty of the eye, by heightening its lustre, and increasing its apparent size.[3]

In the short list just now given of mineral substances mentioned in the Bible, there are three only that require at present further notice. These are alabaster, salt, and nitre. The alabaster of the ancients was not the substance now usually designated by that name, and used to form small

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[1] Gen. 2, 12. Numb. 11, 7.

[2] The Septuagint renders it carbuncle (ἄνθραξ) in one, and crystal in the other of these two passages. It is thought by some commentators to have been *pearl;* by others *beryl;* and by others again, the gum-resin still called by the same name.

[3] Hence was derived one of its names πλατυόφθαλμον.

figures, vases, and other ornaments, which is a granular or compact gypsum; that of the ancients was more commonly a stalagmitic carbonate of lime. The name was applied both to the material and to the vessels made of it, for the purpose commonly of preserving unguents and odoriferous liquids. This is the purpose to which Pliny[1], speaks of it as peculiarly adapted. We find it mentioned in the New Testament as applied to this use, and so it continues to be in Egypt, even to the present day.

Table salt is a mineral with which all are familiarly acquainted; but a knowledge of the characters of that spoken of in the New Testament may throw light upon the text in which our Lord's disciples are compared to the salt of the earth; which, if it lose its savor, is cast out and trodden under foot. The salt alluded to was probably fossil salt, which containing, as such salt generally does, a large proportion of ochrey clay or other earthy matter, was liable from exposure to become insipid. Accordingly Maundrell, in his journey to Jerusalem, tells us that in the valley of Salt, on the side towards Gibul, from a small precipice formed by the continual taking away of the salt, he broke out a piece, of which the part that had been exposed to the sun, rain, and air, though it contained sparks and particles of salt, had entirely *lost its savor*, while that part next the rock still retained, as he found, its saltness.[2] Salt which had thus

[1] Plin. 13, 2—36, 12.

[2] Maundrell's Journey, p. 214.

become insipid might be used for the purpose of repairing roads; or *cast out to be trodden under foot.*

The *nitre* repeatedly mentioned in Scripture was not our nitre, or salt petre; but an impure carbonate of soda, procured from certain lakes in Egypt, which appear from recent accounts to furnish it still in great abundance.[1] These lakes, six in number, lie west of the Delta of the Nile, and are called the Lakes of Natron.[2] Hence the Greeks and Romans derived the names νίτρον, nitrum; which the Latins, as we shall hereafter see, applied, not to natron only, but to a considerable variety of substances containing more or less alkaline salts;[3] and, according to the opinion of some mineralogists, to two other wholly different compounds, muriate of ammonia, or sal ammoniac, and nitrate of potash, or salt petre; to which last only is the name now confined.[4]

The natron, or ancient nitre, was used for the purpose to which we continue to apply the same alkali when combined with oils, in the form of soap. The prophet Jeremiah, therefore, speaks[5] of one washing himself with nitre. And the violent action which ensues the pouring of an acid on an alkali suggested to Solomon his comparison between one "that singeth songs to a

[1] See Champollion's Letters from Egypt.
[2] Broug. Min. 1, 151.
[3] Plin. Hist. Nat. 31, 46. Beckmann's Hist. of Inv. 4, 525.
[4] Kidd's Min. 2, 6. Jameson's Min. 2, 316.
[5] Jeremiah, 2, 22.

heavy heart," and vinegar upon nitre.[1] When vinegar and the salt which *we* call nitre are brought together there is no apparent discrepance between them; but pour vinegar on the nitre of Scripture, and there follows an effervescence, that shows the propriety of the royal penman's simile.[2]

Let us now turn our attention to those valued productions of the mineral kingdom, which furnish the sacred writers with so many images to express beauty, magnificence, purity, solidity, and strength. As when Isaiah, foretelling the future greatness of Jerusalem, says, "Behold, I will lay thy stones with fair colors, and lay thy foundation with sapphires; and I will make thy windows of agates, and thy gates of carbuncles, and all thy borders of pleasant stones."[3] The gems mentioned here and elsewhere in the Bible, we have every reason to believe were, collectively taken, the same which the East continues still to furnish in their highest perfection; but it is impossible at this day to ascertain the species of each individual stone.[4] In the case of some, as of the agate, the onyx, and the beryl; where the name is evidently the same in the *ancient* languages and *now;* while the characters ascribed by ancients and moderns to the stone agree, we cannot be in doubt; but as to

[1] Prov. 25, 20.

[2] Respecting the ancient use of nitrum in washing, see Beck. Hist. of Inv. 3, 231.

[3] Isaiah, 54, 12.

[4] See Harris' Nat. Hist. of the Bible. Goguet Orig. des Loix, 2, 111.

others, again, a comparison of circumstances makes it evident that the ancient name, retained by us, is no longer applied to the same substance. Thus it may be inferred that the ancient chrysolite was either a deep colored variety of the oriental topaz, or the gem called hyacinth by us; while the topaz of the ancients was the stone which we call chrysolite.[1] Learned critics generally agree that the *diamond* was not known in the time of Moses. The word translated diamond in the description of the breast-plate signifies, as is thought, a stone hard to break; or used in breaking others; a description applicable to many oriental gems.[2] The diamond was known at a later period among the ancients, and possessed a high value, but derived chiefly from its extreme rarity and unrivalled hardness. It was a gem of no extraordinary brilliancy nor beauty, since to display these qualities it must be cut and polished, and that art was not discovered until near the end of the 15th century.[3]

The frequent allusion made by the sacred writers to precious stones, as objects of comparison, or otherwise, may have been owing in part to their dwelling in countries near to those whence, chiefly,

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[1] See afterwards the article Topaz.

[2] See Harris' Nat. Hist. of the Bible.

[3] The art of cutting and polishing the diamond was discovered in Europe by Lewis Berghem, in 1456; but some have thought it known to the artists of Hindostan and China at a very early period. (Jam. Min. 1, 9.) Lessing, however, an acute and skilful antiquary, takes certain pretended antique cut diamonds to be sapphires. (See Brong. Tr. Elem. de Min. 2, 61, and Goquet Orig. des Loix, 2, 111.

the most precious gems have always been obtained, and in which we may suppose them to have been less rare in those early ages than at the present day; and therefore to have furnished more familiar images of those natural qualities for which they are admired. And it is for this purpose only, of ornament and illustration, as learned commentators think, that their names are introduced. For although pagan antiquity ascribed various mystical virtues to certain precious stones, it is not intended that those mentioned in Scripture should be "strictly scrutinized, or minutely and particularly explained as if they had each of them some precise and spiritual meaning."

It ought not to escape our notice while upon this subject, that at the early period of the Exodus, the art of polishing, setting, and even engraving precious stones was, as we learn from the description of the ephod and breast-plate, already known and practised. It is true that to engrave merely the names of the children of Israel, there was not required the same degree of skill that we find afterwards displayed amongst the Greeks; but the principles of the art, and the means of execution were probably the same. And this may suggest an illustration of the difference between ancients and moderns, both as to *art* and *science;* for in regard to gems, as to other matters, it may be said, that the ancients possessed less *science;* but very superior *art.* They were wholly ignorant of the chemical composition of these stones;

but engraved them with a consummate taste and skill that have been rarely, if ever, equalled in modern times.

The ancients, regarding the external characters alone, and especially the color, distinguished, as was natural, by different names, the sapphire, the ruby, the emerald, the topaz, and other oriental stones, which now the mineralogist, determined by the results of analysis, classes together, as belonging all of them to a single species. One who in ancient times possessed a colorless sapphire and a polished diamond (if the ancients had been acquainted with any such) might, from their resemblance in transparency, lustre, superior weight, and hardness, have been led to place them among his treasures side by side; while the modern, in arranging his cabinet according to the true composition of minerals, would degrade the diamond from the brilliant society in which it has been used to shine, to take its place with plumbago, anthracite, and coal. To pursue this speculation farther; the artist who from a rude mass of Parian marble produced the Venus de' Medici; and he who converted a shapeless block of Lunensian marble into that form of super-human dignity and grace, the Belvidere Apollo, were not aware that the stone they chiseled was primitive limestone, and might not easily have been brought to believe that of the solid substance upon which they wrought nearly one half the weight was an aerial acid—Ictinus too, when he built the Par-

thenon; and Phidias, while he adorned it with his sculpture, (although the latter is said to have possessed all the science of the age he lived in) were alike ignorant of the nature of the materials they employed; but this their ignorance did not prevent the statuaries and the architect from executing works, which have defied the competition of all succeeding time.

But, from writings in which the mention of mineral substances is rare and incidental, and from which it is by inference only that we can gather any thing respecting their character or properties, let us now turn to authors who treat of them expressly; and adopting for the most part Pliny's order, as was proposed, consider first the metals with which the Greeks and Romans were acquainted. These were the six already mentioned as known to the writers of the Old Testament, and, in addition to them, mercury; which is first spoken of by Aristotle and Theophrastus under the name of fluid silver (ἄργυρος χυτὸς.) Its nature, however, does not seem to have been much understood, even four centuries later; for Pliny distinguishes between quicksilver, *argentum vivum*, and the liquid silver, *hydrargyrus*, procured by processes which he describes, from minium, or native cinnabar. This hydrargyrus he supposes to be a spurious imitation of quicksilver, and fraudulent substitute for it in various uses to which it was applied.

We shall hereafter find reason for believing that

the ancients had seen zinc and antimony in their metallic form; and it is probable they occasionally met with arsenic, bismuth, and other of the now known metals which occur in a native state, but confounded them with some one of the seven with which they were more familiar. They were well acquainted with zinc, arsenic, and antimony, in certain of their combinations; but as reguli, or pure metals, it was by the alchymists that these three were first distinctly recognised. There has been, however, no great difference between ancients and moderns as to the state of knowledge on this head until within a period comparatively late; for although there are now, including the metallic bases of the earths, as many as forty metals ascertained, yet all of them, except bismuth and the ten already mentioned, have been discovered within the last hundred years.

Gold, the metal which ranks highest in the estimation of mankind, was, probably, one of the first, if not the first, with which they were acquainted. It was found in a native state in almost every country of the ancient world, and abounded in the sands of many ancient rivers which have long since ceased to be auriferous. Such was the case with the Pactolus even in Strabo's time,[1] though at a more ancient period it had been proverbial for its golden sands. Nor are the Tagus, the Po, the Hebrus, and the Ganges, any longer celebrated

[1] Strabo. Geogr. p. 626.

upon this account, as they once were.[1] Whence it seems reasonable to infer, that in proportion as we go back into remote antiquity, we may regard this source of supply as having been abundant. From the facility with which this gold, than which as Pliny observes[2] there is none purer, was to be obtained, even in the earliest stages of society, we may account in part for the prodigious quantity on some occasions spoken of by ancient authors. As in the account given of the wealth of Solomon;[3] in the description we find in Diodorus Siculus of the tomb of king Osymandyas,[4] and of the statues, table and vessels of gold dedicated by Semiramis;[5] in Herodotus' account of the wealth of Crœsus, and his presents to the oracle of Delphi, as also of the tribute paid to Darius Hystaspes by the several provinces of his empire.[6]

But this apparent abundance of gold is also to be explained in part from the fact of its having been accumulated at certain periods chiefly in some one place; as at Babylon, under Semiramis; at Jerusalem, under Solomon; at Sardis, under Crœsus; at Babylon again, under Darius, and afterwards until the death of Alexander. At Alexandria, perhaps more than elsewhere, under his

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[1] Plin. 33, 25.
[2] Plin. 33, 21.
[3] 1 Kings, c. 6, v. 20—22; c. 10, v. 14—21.
[4] Diod. Sic. 1, 49.
[5] Diod. Sic. 2, 9.
[6] Herod. lib. 1, c. 56, seqq. 92. Lib. 3, c. 90, seqq.

successors; and afterwards at Rome, while she was at the summit of her power. Gold, too, having been used in the earlier ages almost solely for purposes of ornament, not as a medium of exchange, was therefore less likely to be either hoarded in the shape of money, or scattered through a multitude of hands. Copper having been found anciently in a native state as well as gold; and sometimes in great abundance, even on the surface of the ground; we hear of ancient nations using no other metals than these two. Thus we are told by Herodotus[1] that the Massagetæ use copper for their spears and other weapons of offence, gold for the ornaments of their persons; copper for the breast-plates of their horses, but for the ornaments of their reins, their bits, and their trappings, gold. Of iron and silver, he says they make no use, nor are these metals found in their country; but copper and gold in very great abundance. He speaks of the North of Europe as especially abounding in gold,[2] and of the Scythians burying with the bodies of their kings vessels of gold; but making no use of copper or of silver.[3]

The first mention of gold and silver, is where Abraham is described as "very rich in cattle, in silver, and in gold."[4] The earliest mention of them, as applied to any use, is in relation to the ornaments which Abraham's servant presented to

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[1] Herodotus, 1, 215.
[2] Herod. 3, 116.
[3] Herod. 4, 71.
[4] Gen. 13, 2.

Rebekah,[1] "Ear-rings, bracelets, jewels of silver and of gold." And Pharaoh is spoken of in the same book as putting a gold chain about Joseph's neck;[2] so that we find the most ancient uses of gold were much the same with those to which it still continues to be applied. But it is spoken of throughout the Bible and Homer, the most ancient books, sacred and profane, as employed for a vast variety of purposes, useful as well as ornamental; and, however abundant it may have been at times, seems always to have been regarded as what Pindar styles it,[3] "a conspicuous ornament of lordly wealth." It was sometimes anciently, as it now is, applied to uses in the arts for which it was peculiarly fitted by its incorruptibility. Thus we find that it was used, even at Rome, and above three hundred years before the Christian era, for securing in their places artificial teeth. A law of the twelve tables making an exception as regards such gold, and permitting it to be buried together with the dead.[4]

Among the uses to which gold was anciently applied, it may deserve mention that a tissue was sometimes made of it without admixture of any other substance. Pliny says[5] he had seen Agrippina, wife of Claudius, seated at his side during the exhibition of a naval combat, clothed in a robe of gold woven without other material. Dion Cas-

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[1] Gen. 24, 22. [2] Gen. 41, 42. [3] Olym. 1, 4.
[4] Cic. de Leg. 2, 24. [5] Plin. 33, 19.

sius speaks of the same occasion, when Agrippina was, according to him, arrayed in a cloak of gold (χλαμύδι διαχρυσίῳ ἐκοσμεῖτο.) Lampridius in his life of Heliogabalus, mentions a tunic of the same kind worn by him,[1] and Sidonius Apollinaris alludes to the mode of weaving such cloth of gold.[2]

Though it is probable the auriferous sands of rivers and alluvial plains furnished anciently, as perhaps they do still, the greatest quantity of gold, yet there were mines worked at a very early period. Cadmus is said to have opened the first mine of copper and gold in Mount Pangæum;[3] the same region from which, eleven hundred years later, Philip of Macedon derived the treasures which enabled him to prosecute successfully his ambitious schemes. The Pharaohs drew great quantities of copper and gold from the mines of Nubia and Ethiopia;[4] and it appears that mines of copper and gold were worked in Siberia during a very remote antiquity by some people unacquainted with the use of iron tools.[5] These mines, which are on the southern and eastern borders of the Ural mountains, and have been examined of late years by Gmelin, Lepechin, and Pallas, were probably among the sources whence those Scythians, of whom Herodotus makes mention, drew their gold.

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[1] Aldi. edit. fo. 112. [2] Carm. 22, v. 199. [3] Strabo. p. 998.

[4] Diod. Sic. 3, 11, and the original source in Photii Biblioth. c. 1339.

[5] Jacob's Hist. of the Prec. Met. c. 2.

There were in Thasos, and other Greek islands, very ancient gold mines, originally opened by the Phœnicians. Herodotus tells us he had himself seen these Phœnician mines of Thasos, and that a great mountain had been overturned there in searching for the metal.[1]

Spain also contained rich mines of gold; and an ancient city of its Atlantic coast, Tartessus, is supposed to have been the Tarshish of Scripture.[2] Strabo declares[3] that no country in the world produced gold, silver, copper, and iron in so great abundance, and of so good a quality as that part of Spain called Turditania, and its neighborhood; and Pliny observes[4] that the barren mountains of this country, which yielded nothing else, were rich in gold. The same author speaks of gold mines in the territory of Vercellæ, in Italy, in which to employ more than five thousand men was expressly prohibited by law.[5] Diodorus Siculus mentions Arabia as producing the finest native gold, (χρυσὸς ἄπυρος) in pieces about the size of a chestnut, and of so bright a color that artists used it in setting the most precious stones to form beautiful ornaments.[6]

Silver and gold, as they are generally found associated in varying proportions, were anciently, in most cases, gotten from the same mines. Pliny observes that silver is derived from mines only;

[1] Herod. 6, 47.
[2] Bocharti Geogr. Sac. 3, 7. col. 170.
[3] Strabo. p. 146.
[4] Plin. 33, 21.
[5] Plin. 33, 21.
[6] Diod. Sic. 2, 50.

that it was found in almost all the Roman provinces, but the best in Spain; and was, like gold, obtained from a barren soil and mountains. The mines opened in Spain by Hannibal, certain of which had yielded him three hundred pounds of silver daily, were in Pliny's time not yet exhausted, and the mountain that contained them had been excavated to the distance of a mile and a half.[1] This country would appear, from the account which Diodorus gives,[2] to have been among the principal sources of this metal; and, perhaps, hence chiefly even the East may have drawn its supplies. But many other countries furnished silver besides Spain; and while upon this subject it would not be right to omit all mention of that "fountain of silver, treasure of the earth," which Æschylus says[3] the Athenians possessed. The mines of Laurium, to which he alludes, were probably more productive at about his time than at any period before or since. They do not appear to have been at any time very profitable, as compared with those of other countries, and though they continued for many centuries to employ great numbers of men, they, during a great portion of the time, scarcely defrayed the expense of working them. Strabo speaks of them as originally valuable, but in his time exhausted.[4]

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[1] Plin. 33, 31.

[2] Diod. Sic. 5, 35.

[3] Æschyl. Pers. v. 238.

[4] Strabo. Geogr. p. 399, where see Casaubon. These mines are mentioned by Herodotus, Thucydides, Pausanias, and others, and

Silver and gold are spoken of together on occasion of the presents before alluded to, brought by Abraham's servant to Rebekah, "jewels of silver and jewels of gold;"[1] but a mention of silver, as applied to use, occurs in the preceding chapter, where Ephron values his field at four hundred shekels of silver, which are weighed to him by Abraham, and styled *current with the merchants*, that is, probably, of the due fineness. From this passage, as from that in which Joseph's brothers are said to have sold him for twenty pieces of silver;[2] from their taking with them silver on both occasions of their going into Egypt to buy corn;[3] and from Joseph's accumulating all the silver of Egypt and of Canaan in exchange for corn,[4] we may infer that at a very early period, silver, though not coined, was a usual medium of exchange. This was a use to which gold does not appear to have been so soon applied, though in other respects the two metals were employed for like purposes. We find drinking vessels, statues, idols, altars, ornaments of temples, houses, and the person, made sometimes of one, sometimes of the other metal; and, in the same ornament, or arti-

Xenophon wrote his treatise *περί προσόδων*, or on the revenues of Attica, to encourage the Athenians to explore them.

[1] Gen. 24, 53.

[2] Gen. 37, 28. Here the Septuagint has *ἴκοσι χρυσῶν*, twenty pieces of gold.

[3] Gen. 43, 12.

[4] Gen. 47, 14. In all these passages, the Septuagint has *silver*; but in our Bible the word used is *money*.

cle of furniture, frequently, the two combined.[1] Mirrors in Pliny's time were commonly of silver. He says the best had been those manufactured at Brundisium, of a mixture of tin and copper,[2] until even the female slaves began to use them made of silver. It seems they were sometimes of this metal, as early as when Plautus wrote;[3] and Seneca speaks of them in his time as being made "of the full length of the body, of silver and of gold, carved and adorned with precious stones."[4]

Electrum, a native alloy of gold and silver, is a compound of which the ancients sometimes speak as though it were a simple substance; for the reason, probably, that they were unable, readily, to separate the metals of which it was composed.

Pliny, having observed that all gold contains more or less of silver, adds that when the silver is in the proportion of one fifth, the alloy is called *electrum*, which, he says, is also artificially compounded, silver being added to gold in the required proportion.[5] He understands Homer as meaning this alloy where ἠλέκτρου is mentioned in the description of the palace of Menelaus;[6] but Eustathius thinks that in this passage amber is the substance meant.

Klaproth has applied the name electrum, to

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[1] Hom. Od. δ. v. 125—η. v. 89. [2] Plin. 33, 45.

[3] Plaut. Mostell. 1, 3, 111.

[4] "Totis paria corporibus, auro argentoque cœlata, gemmis adornata." Sen. Nat. Quæst. 1, 17.

[5] Plin. 9, 108. [6] Hom. Od. δ. v. 73.

argentiferous native gold; to which, as we have seen, it anciently belonged, when the silver was in the above mentioned proportion of one fifth.

From the two more precious metals, gold and silver, we come next to two which possess a much greater value in use than in exchange; and which, in the times we now treat of, stood in such close relation to each other, that we shall find it convenient to consider them, in some measure, under the same head.

Iron, as well as copper, was in use before the deluge; for Tubal-Cain, we are told, was "an instructer of every artificer in brass and iron."[1] It is not probable that a knowledge of such useful auxiliaries, once acquired by man, would ever have been lost.

The art of working iron, therefore, and the use of weapons, and other things made of it, appears to have been known among the Egyptians at a very early period; and Moses was well acquainted with this metal; though neither by him in the construction of the tabernacle in the wilderness, nor by Solomon afterwards in the building of the temple, does it appear to have been employed.

Moses compares the deliverance of the Israelites from Egyptian bondage, to their being "brought forth out of the iron furnace."[2] He uses the terms iron and brass indifferently, in a figurative sense, as emblematic of something stern and hard:

[1] Gen. iv. 22. [2] Deut. iv. 20.

"I will make your heaven as iron and your earth as brass;"[1] and elsewhere, "thy heaven that is over thy head shall be brass, and the earth that is under thee shall be iron."[2] He mentions "a yoke of iron," also, in a figurative sense. We are told that the bedstead of Og, king of Bashan, "was a bedstead of iron."[3] Mines of iron are spoken of;[4] and it appears that hostile weapons, and tools for cutting stone, were sometimes made of iron.[5] However, during times of high antiquity, brass or copper was much more used than iron; especially among nations that had made little progress in the arts. Hesiod speaks of iron as, during the brazen age, unknown; "their weapons, dwellings, tools, were all of brass."[6]

The reason of this is obvious. Iron is not found in a native or metallic state, and the skill in metallurgy was often insufficient to reduce it from its ore and work it; but native copper is occasionally found in almost every country; and sometimes in large masses, even on the surface of the earth; and this metal and its alloys, may be worked with much greater ease.[7] Accordingly uncivilized tribes have been discovered, on the north-west coast of America, and elsewhere, making use of copper implements; and it is with good reason that Werner conjectures it was the

[1] Levit. 26, 19. [2] Deut. 28, 23. [3] Deut. 3, 11.
[4] Deut. 8, 9. [5] Num. 35, 16.—Deut. 27, 5.
[6] Hesiod Ἔργ. καὶ ἡμ. v. 150.—Lucretius too, says, lib. 5, v. 1286. "Et prior æris erat quam ferri cognitus usus."
[7] See Goguet Orig. des Loix, &c., t. 1, p. 141.

first metal worked by man. Axes and other instruments of brass have been found in tombs of the ancient inhabitants of Mexico and Peru; and from the latter country Humboldt took a chisel, which Vauquelin ascertained to consist of .94 of copper, and .06 of tin. This alloy was so well forged that it had a specific gravity of 8. 815, a maximum of density, which, according to the experiments of Mr. Briche, a chemist does not obtain but by a mixture of 16 parts of tin with 100 of copper.

Brass was a very indefinite term among the ancients; the simple metal copper, and all the different compounds into which it entered as a principal ingredient, being comprehended under the same name, χαλκὸς, æs. When, therefore, in Scripture, and in ancient authors generally, brass is spoken of, we are seldom to understand the alloy now designated by that name, although that is sometimes meant; but the brass tempered for edge tools, or formed into warlike weapons, was generally a compound of copper and tin. And the proportion between the two metals seems to have been, in most cases, nearly that just now stated as affording the maximum of density. An ancient dagger analysed by Hielm, was found to contain about five parts of copper and one of tin; and other analyses of ancient weapons, found in countries widely distant from each other, have afforded much the same result.[1] The same metals,

[1] See Ure's Chem. Dict. art. Copper. The nearly identical result

combined in various proportions, are still applied to many important uses; and sometimes to mould brazen cannon, those more formidable instruments of modern war.

It is probable that in remote antiquity, copper was oftener employed than any alloy of it. Indeed, there still remain both warlike weapons, and artisans' tools, made of the simple metal. From Homer's saying, that the spear of Iphidamas did not pierce the girdle of Agamemnon; but that "its point was turned as though it had been lead, when it struck upon the silver,"[1] we may fairly infer that the spear head was copper, rather than any hard alloy of it. In the ancient mines of Siberia, which have lately been examined, hammers and wedges of copper have been found.[2] There is every reason, therefore, to suppose that the words χαλκὸς and *æs*, should be rendered by the word *copper*, much oftener than they are.

Pliny distinguishes *copper* as æs Cyprium, brass of Cyprus; in which island, he informs us,[3] it was first discovered; but he gives the name *æs* to the alloys of copper, not with zinc only, but with gold, silver, tin, and lead; with all which metals it was

obtained in such a diversity of cases favors the belief that this ancient brass was a native alloy, procured from long since exhausted sources of an ore, in which, as in the bell metal ore of Cornwall, tin and copper were united, and in the proportions requisite to give the compound its greatest density and hardness. And this may be that brass of which Pliny speaks (34, 2) as in his time no longer found, the mines that once furnished it having become exhausted.

[1] Hom. Il. λ. v. 236. [2] Jacob's Hist. of the Prec. Met. p. 27.

[3] Plin. 34, 2.

mixed, and in different proportions, according to the color or other qualities required in the compound, or the uses to which it was to be applied. Among the rest, Pliny specifies three varieties of Corinthian brass, more precious, he remarks, than silver, nay, almost preferred even to gold itself.[1]

Some of the most valued productions of ancient art, were in brass of Delos and Ægina; those two islands having been celebrated for their manufacture of a material well suited for the statuary. Myron used the brass of Delos, and Polycletus that of Ægina.[2]

Pliny gives for statuary brass a recipe, according to which there is added to the melted copper, one third part of old brass, worn and polished by use, (æs collectaneum) with twelve and a half per centum of an alloy called plumbum argentarium,[3] which consisted of equal parts of lead and tin.[4]

Aristotle informs us that the Mossynœcians had anciently prepared a brass of a pale color and superior lustre, mixing it, not with tin, but with a certain earth found amongst them.[5] This earth was, no doubt, the cadmia of Pliny, our calamine, an ore of zinc. Though we have reason to believe that Pliny has comprehended under the term cadmia, an ore of copper abounding in zinc, from which was procured the brass called *orichalcum*, or mountain brass, the kind most highly valued;

[1] Plin. 34, 1.
[2] Plin. 34, 4, 5.
[3] Plin. 34, 20.
[4] Plin. 34, 48.
[5] Arist. Op. v. 1. p. 1155. B.

but the mines of *orichalcum* becoming exhausted, as we find that in Pliny's time they were,[1] an imitation of the native alloy was produced by mixing with copper the ore of zinc called calamine. Keferstein supposes,[2] but perverts the language of Aristotle to favor his idea, that the Mossyncœcian brass was white copper, an alloy of copper and arsenic. That the ancients, however, were acquainted with, and made use of a white copper is undoubted, for in the Herculanean Museum there are pateræ and other articles made of such alloy;[3] and perhaps the *æs candidum* mentioned by Pliny as used together with copper and tin in making mirrors[4] may have been obtained from copper ores that abounded in arsenic, which now also enters into the composition of speculum metal. The *æs candidum*, spoken of as one variety of the Corinthian brass,[5] seems to have owed its color to the large quantity of silver it contained. When Virgil speaks[6] of a cuirass, "auro squalentem alboque orichalco," the epithet, as Cerda and others think, indicates the splendor merely of the brass; as Hesiod[7] and Apollonius Rhodius[8] speak, ὀρειχάλκοιο φαεινῆ. That orichalcum was of the color of our brass may be inferred from the case which Cicero

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[1] Plin. 34, 2. [2] Philosoph. Mag. v. 63, p. 126.
[3] Winck. Mon. Ant. Ined. vol. 2, p. 172.
[4] Plin. 34, 48. [5] Plin. 34, 2. [6] Æn. 12, v. 87.
[7] Shield of Herc. v. 122.
[8] Argonaut. 4, 973. Winckel. Mon. Ant. Ined. vol. 2, p. 172.

supposes of a man ignorantly selling gold by mistake for it.[1]

The uses to which copper and its alloys were applied, are far too numerous to admit of being specified. The mechanics' tools, implements of agriculture, weapons and defensive armor, useful and ornamental articles of household furniture, coined money, statues, in some cases doors, columns, and even roofs were made of brass.[2] With the advance of society, and the improvement of the arts of life in modern times, we find the use of iron continually extended, and the purposes to which it is applied, daily more and more diversified. In proportion as we go back into antiquity, we find its use more rare, and its place supplied by other metals; thus nails and bolts were made of brass,[3] and the anchors of the Phœnicians were of lead.[4] The Romans, however, used iron for purposes both of war and peace, at least as early as the sixth century before the Christian era; for Pliny speaks of a stipulation in the treaty made with them by Porsenna, which prohibited their use of iron except in the cultivation of the soil.[5]

In the Trojan age, and Homer's time, iron was well known; and the poet employs, as Moses does, the names of iron and brass, in both a literal and

[1] Cic. de Off. 3, 23.

[2] Plin. 34, 7. Respecting the abundance of brass in the earlier times of Rome, and the probable sources of it, there are some remarks in Niebuhr's Hist. of Rome, v. 1, p. 451.

[3] Dioscor. 5, 88. Athenæi Deipnos. 5, 40.

[4] Diod. Sic. 5, 35. [5] Plin. 34, 39.

a figurative sense; as though the two metals were applied indifferently to the same purposes, whether of war or peace; and regarded as possessing in like manner the properties of hardness and tenacity. Iron, however, was used much more sparingly than brass; being, for the reasons no doubt that have been stated, much the rarer of the two. Accordingly we find that a rudely cast round mass of iron, (σόλος αὐτοχόωνος) which had been used by Eëtion as a quoit, is represented by Achilles, when he offers it among the prizes at Patroclus' funeral, as "a five years provision of iron for one who cultivates extensive and rich fields, so that his shepherd or his ploughman, when they need iron, may, without going to the city for it, satisfy their wants."[1] Hence we learn that it was used, though in very small quantity, for implements of agriculture. This passage, certainly the most remarkable one in which iron is spoken of by Homer, is sometimes referred to as though it were the only one; but most incorrectly as we shall perceive. It is mentioned as an article of commerce, where Mentes tells Telemachus that he has iron, which he is going to exchange at Temese for brass.[2] Axes were sometimes made of iron. A chariot builder is spoken of as felling a tree, αἴθωνι σιδήρῳ.[3] Those axes through which the suiters were to shoot, often as they are spoken of, are always called iron (σίδηρος) or polished iron (πολιὸς σίδηρος.)[4]

[1] Il. ψ. 826. [2] Od. α. 184. [3] Il. δ. 485.

[4] See Hom. Od. δ. 587. φ. 3, 81, 97, 114, 127, 328. ω. 167, 176.

Weapons of war were sometimes made of it. The iron weapon is said to invite men; that is, to tempt them to violence.[1] Autilochus holds the hands of Achilles lest he should cut his own throat σιδήρῳ.[2] An "iron arrow head" is mentioned,[3] and Areithous breaks the phalanxes with "an iron club."[4]

The tempering of iron by plunging it into water, is alluded to.[5] It is repeatedly styled "much labored," (πολύκμητος,) and is classed with gold and brass as a thing of value. Among the treasures collected by Ulysses, are mentioned, "brass and gold and much labored iron."[6] Achilles enumerates as part of his booty, "gold and red brass and bright iron." (πολιόν τε σίδηρον.)[7] Adrastus speaks of his father's treasures, which Menelaus should receive as ransom for his life, "brass and gold and much labored iron;"[8] and the sons of Antimachus offer the same ransom to Agamemnon.[9]

The scarcity and value of iron in remote ages is inferred by Mr. Jacobs from discoveries made of late years in the ancient Scandinavian tumuli. "There are swords, daggers, and knives, the blades of which are of gold, whilst an edge of iron is formed for the purpose of cutting. Some of the tools and weapons are formed principally of copper, with edges of iron; and in many of the imple-

[1] Od. π. 294. τ. 13. [2] Il. σ. 34. [3] Il. δ. 123.
[4] Il. η. 140. [5] Od. ι. 393. [6] Od. ξ. 324. φ. 10.
[7] Il. ι. 366. [8] Il. ζ. 48. [9] Il. λ. 133.

ments, the profuse application of copper and of gold, when contrasted with the parsimony evident in the expenditure of iron, seems to prove that at the unknown period, and among the unknown people who raised the tumuli which antiquarian research has lately explored, gold as well as copper were much more abundant products than iron."[1]

But to return to Homer for a moment: he repeatedly makes use of the term σίδηρος, *iron*, and the adjectives derived from it, in a figurative sense. The *iron* tumult is said to reach the *brazen* heaven;[2] and the insolence and violence of the suitors to reach the *iron* heaven.[3] The iron strength of fire is spoken of;[4] and a resemblance in strength, ἄιδηλον σιδήρῳ.[5] The bodies of the Greeks are said not to be of stone or iron, so as to resist the piercing brass,[6] and Euryclea compares herself to "firm stone or iron."[7] Telemachus is told that his father will not remain much longer absent, "even though iron chains should hold him;"[8] and he speaks of his father having perished, "although he had an iron heart within him."[9] Ulysses is told that he is insensible to the sufferings of his companions, because he himself knows not fatigue; "that he is altogether formed of iron;"[10] and Hecuba, think-

[1] Jacob's Hist. of the Prec. Met. p. 10.
[2] Il. ρ. 424. [3] Od. ο. 328. [4] Il. ψ. 177.
[5] Il. ν. 372. [6] Il. δ. 510. [7] Od. τ. 494.
[8] Od. α. 204. [9] Od. δ. 293. [10] Od. μ. 280.

ing Priam insensible to the danger he is about to brave, declares "he has an iron heart."[1] Ulysses' eyes are said to remain as unmoved as if they were of horn or iron.[2]

The Greeks of a much later age than Homer's marked the distinction between steel and iron, by calling the former στόμωμα; the word στομόω signifying to give a temper or keen edge to a cutting instrument.

The ancients sometimes made steel by a process that has been employed even in modern times. The crude iron, purified by repeated melting, and deprived of a portion of its carbon by being kept long in a state of fusion, was converted into steel. This at least seems to be the rationale of the mode described by Aristotle, who says[3] the iron was purified from the scoria by melting, and when it had been treated thus several times, and became pure, was changed to steel (στόμωμα). Ancient steel is thought to have been made in some cases, as German steel is said to be, directly from cast iron, merely by forging the crude metal to a certain point.[4] A mode of making steel, in use among the Celtiberi, is thus described by Diodorus Siculus:[5] "They bury in the earth," says he, "forged plates of iron, and leave them till in length of time the rust has consumed the feebler parts of the metal, and left the firmer, of which they make excellent swords,

[1] Il. ω. 205. [2] Od. τ. 211. [3] Vol. 1. p. 590.
[4] Parke's Chem. Ess. v. 1. p. 16. [5] Lib. 5. c. 33.

and other weapons, such that neither shield nor helmet nor bone are able to resist them." Plutarch[1] and Suidas[2] also speak of this same excellent steel; and a similar process is said to be still used in Japan; where the iron is buried in marshy ground till a great part of it is consumed by rust, when it is taken up and forged, and again buried for eight or ten years; when what remains is found converted into a sort of steel, of which they make plough-shares, and other tools, and weapons. The Japanese sabres are said to be incomparable, and of such temper that they will easily cut through a nail without injuring their edge.[3]

But besides other ancient modes of preparing steel, there can be little doubt that it was in some instances obtained directly from such ores as are now sometimes called steel ores; and simply by the process used in making bar iron; and the virtue which Pliny[4] ascribes to the waters of certain places, as Bilbilis in Spain and Comum in Italy, may have belonged rather to the ores which were there usually employed.

But whatever may have been the way in which the ancients made their steel, this at least is certain, that they possessed instruments of such a tem-

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[1] Plut. de Garrulitate, vol. 2. p. 510.

[2] Word μάχαιρα, vol. 2. p. 510.

[3] Beck. Hist. of Inv. 4, 242, 243.

[4] Plin. 34, 41.

per as to carve porphyry and other stones that resist the tools of modern artists.[1]

Steel was sometimes called χάλυψ, chalybs, because obtained, of an excellent quality, from the country of the Chalybes.[2] The Indian steel, (σίδηρος Ινδικὸς καὶ στόμωμα,) mentioned by the author of the Periplus,[3] was probably of the kind still brought from India, under the name of wootz; and the *ferrum candidum*, of which Quintus Curtius says,[4] The Indians presented to Alexander an hundred talents, may have been the same; for wootz, when polished, has a silvery lustre.[5] And that kind which Pliny styles *Sericum*, and to which he assigns the palm, was perhaps no other.[6] The Parthian steel ranks next with Pliny, and these two kinds only "mera acie temperantur."

Daimachus, a writer contemporary with Alexander the Great, speaks of four different kinds of steel, and the purposes to which they were severally suited. "Of steels (τῶν στομωμάτων) there is the Chalybdic, the Synopic, the Lydian, and the Lacedæmonian. The Chalybdic is best for car-

[1] Respecting the mode and the difficulty of working porphyry, see Winckelmann Storia delle Arti del Disegno, v. 1. p. 88. v. 2. p. 15.

[2] Eudoxus, cited by Stephanus, (χαλυβες p. 714,) says, ἐκ δὲ τῆς Χαλύβων χώρας ὁ σίδηρος, ὁ περὶ τὰ στομώματα ἐπαινούμενος, ἐξάγεται, from the country of the Chalybes is derived the iron, which is most approved for the steeled parts of instruments.

[3] See Plin. Exercit. p. 763. b F.

[4] Lib 9. c. 8. [5] Beck. Hist. of Inv. 4. 248.

[6] Ex omnibus autem generibus palma Serico ferro est. Plin. 34, 41.

penters' tools; the Lacedæmonian for files, and drills, and gravers, and stone chisels; the Lydian also is suited for files, and for knives, and razors, and rasps."[1]

What Aristotle, Daimachus, and Eudoxus, in the passages that have been cited, call στόμωμα, and Plutarch calls σιδήρου στόμωμα καὶ ἀκμὴν,[2] is by Latin writers called *acies*, *ferri acies*. This, in the barbarous latinity of a later period, came to be called *acierium*, and hence the French *acier*. The Greek and Latin terms seem to indicate that steel was employed, as in many cases it still is, merely for the edge; "ad indurandam aciem" of cutting instruments, and for such part of other instruments as needed its harder temper; so that στόμωμα did not so much denote steel itself, as the steeled part of the instrument.[3]

Lead and Tin are metals which we have the best reason for treating of under the same head, since the ancients frequently confounded them; and, however strange may appear such confusion in regard to metals so plainly distinguished by their properties as these, their names, nevertheless, in Hebrew, Arabic, Greek, and Latin, are often indifferently used.[4]

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[1] See Stephanus de Urbibus, word Lacedæmon, and Fabricii Bib. Græc. vol. 2. p. 588.

[2] Vol. 2. p. 693 A.

[3] Beck. Hist. of Inv. 4. 236.

[4] Salm. de Hom. Hyl. Iatr. p. 234.

The Greeks, when they would distinguish the two metals, called tin κασσίτερος, and lead μόλιβδος; but, as the French at this day call pewter *etain*, and confound it with pure tin, so did the Greeks comprehend under the name κασσίτερος, various alloys of tin with lead or other metal; and some such Homer is supposed to mean when he speaks of tin (κασσίτερος) used in the fabrication or ornament of various parts of armor.[1]

The Romans distinguished lead (plumbum) into black and white.[2] The latter, plumbum album, was the more precious, Pliny says, being what by the Greeks was called κασσίτερος.

Plumbum album[3] is sometimes called stannum, while on other occasions the latter is spoken of as something different, in which case it may have been an alloy of tin and lead; or, as Beckmann thinks, of silver and lead; or it may have been designated by a different name merely because obtained from a different place, from an ore of different appearance, or by some different process; since any one of these, we know, was anciently sufficient ground of distinction between substances that were in fact identical. If any reliance could be placed on Pliny's accuracy in a matter of this

[1] Mention of κασσίτερος occurs ten times in the Iliad; once as used about a chariot; but on every other occasion about breast-plate, shield, or greaves.

[2] Plin. 34, 47.

[3] What *we* term *white lead*, the ψιμμύθιον of the Greeks and cerussa of the Romans, was made anciently by processes that are in use even at the present day. (Dioscor. 5, 103. Plin. 34, 54.)

kind, we might infer from what he says of the mode in which stannum was obtained,[1] that the ancients were acquainted with an argentiferous galena, containing also tin. Beckmann, however, in his examination of this passage, says that lead is seldom found without, but that tin, perhaps, has never been found with silver. He admits that the passage in question cannot be fully understood with any explanation, yet he thinks it proves to conviction that the stannum of the ancients was not tin, but a mixture of silver and lead, called in the German smelting houses *werk*. It is from stannum, however, that are derived the names *etain* and *tin*. He supposes the oldest κασσίτερος to have been nothing else than the stannum of the Romans. Aristotle, however, relating[2] a phenomenon applicable to tin calls the metal τὸν κασσίτερον τὸν Κελτικον.[3]

Pliny treats as a fable the account of tin being brought from islands in the Atlantic sea; the only localities with which he seems acquainted being Gallicia and Lusitania; where it was found, he says,[4] on the surface of the earth, in grains of a black color, and detected only by its weight. It is now found in Gallicia, in veins traversing granite and mica slate.

Herodotus too professes his ignorance even of the existence of islands called Cassiterides, whence

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1 Plin. 34, 47. 2 Beck. Hist. of Inv. v. 4, pp. 10, 20, 26.
3 Beck. Hist. of Inv. 4, 21. Arist. Auscult. Mirabil. v. 1, p. 1154.
4 Plin. 34, 47.

tin was brought;[1] but Strabo describes them,[2] ten in number, as possessing mines of tin and lead, which, together with skins, they exchanged for earthen ware, salt, and brazen vessels, with the merchants, who visited them; the Phœnicians alone having at first carried on this trade from Cadiz. These Cassiterides, which Strabo speaks of as distinct from Britain, were what we now call the Scilly islands, and probably received the metals they traded in from the opposite coast of Cornwall. Diodorus Siculus regards them as belonging to Spain rather than to Britain; and Dionysius Periegetes, speaks of them as inhabited by Spaniards. The former author, having observed that tin occurs in many places in Spain, not on the surface, as some historians have reported, but dug from the earth, and smelted as gold and silver are, adds that there are many mines of it in islands, which thence derive their name, Cassiterides, lying over against the coast of Spain; and that much was brought from the island of Britain also, through Gaul, to Marseilles and Narbonne.[3] The latter author, having in view perhaps their western position only, calls them the Hesperides, the source of tin.

Νήσους θ'Εσπερίδας, τόθι κασσιτέροιο γενέθλη.[4]

Lead was obtained in abundance from Spain, Gaul and Britain;[5] and applied to much the same

[1] Herod. 3, 115. [2] Strabo. p. 75. [3] Diod. Sic. 5, 38.
[4] Dion. Perieg. v. 563. [5] Plin. 34, 49.

uses as in modern times. Mixed with tin in equal proportion it constituted plumbum argentarium; and with one third part of tin, tertiarium.[1] These were used in the composition of statuary bronze, and the latter of them for the solder of leaden pipes; in making which pipes a vast quantity of lead must have been employed, considering the mode in which ancient cities were supplied with water, and the common use of baths.[2] It was also used, as we shall see, in preparing the common pigments, white and red lead. It, or its ore, was indispensable in the refining of silver, Pliny tells us;[3] and Theognis speaks of it, more than five centuries earlier, as used in refining gold;[4] as do likewise Diodorus Siculus,[5] and others.

But among the uses to which plumbum album and stannum were applied, well deserves to be noticed the coating, or tinning, as we term it, of copper vessels, (which, Pliny tells us,[6] rendered the taste more agreeable, and guarded against the poisonous effects of verdigris,) and the covering in like manner, ornamental articles of copper, so that they could scarcely be distinguished from silver. For this manufacture were famous the Bituriges, the modern Bourges; and another town of Gaul, Alesia, the modern Alise, afterwards employed silver for a like purpose, the plating harness and carriages of various kinds.[7]

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[1] Plin. 34, 48. [2] See Vitruv. 8, 6. [3] Plin. 33, 31.
[4] Theog. Γνωμ. v. 1101. [5] Diod. Sic. 3, 13.
[6] Plin. 34, 48. [7] Ibid.

The ore from which the ancients procured their lead was that which now furnishes almost all the lead of commerce; the sulphuret termed by us galena. A name which Pliny also uses,[1] but as synonymous with molybdena; which is described by Dioscorides[2] and himself as an argentiferous ore of lead. This latter name, molybdena, has been adopted by us to designate a new and wholly different metal.

Mercury has already been spoken of, as known to the ancients, at least as early as Aristotle's time. Vitruvius describes an useful application of its property of forming with gold an amalgam; and says that silver and copper cannot be rightly gilt without it.[3] And the mode of doing this Pliny has described.[4]

It seems proper to notice here, again, in connexion with the subject of metals, terra cadmia, or calamine; an ore of zinc already spoken of; a substance with which the ancients were well acquainted, though they are commonly supposed not to have known zinc itself, except as combined with copper in the form of brass. But a passage in Strabo authorizes the belief, that they also knew this metal in its separate state. The Geographer says,[5] that near Andeira, a town of Troas, is found

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[1] Plin. 34, 53. [2] Dioscor. 5, 100. [3] Vitruv. 7, 8.

[4] Plin. 33, cc. 20, 42. Consult also, respecting the method of gilding made use of by the ancients, Winckelmann Stor. delle Arti del Disegno, v. 2, p. 29.

[5] Strabo. p. 610.

a stone, which being burnt becomes iron; and distils false silver (ἀποστάζει ψευδάργυρον) when heated in a furnace together with a certain earth, which receiving the addition of copper, forms the alloy that some call brass (ὀρείχαλκον.) He adds, respecting this *false silver*, which was probably our zinc, that it occurs also near the Tmolus. Stephanus states the same thing in somewhat clearer words, and refers to both Theopompus and Strabo as authorities.[1]

This earth, which is supposed to derive its name, Cadmia, from Cadmus, son of Agenor,[2] who first introduced at Thebes the making of brass,[3] is spoken of by Aristotle, in a passage before referred to,[4] but by no name; and Theophrastus, also, alludes to, but without naming it; for after having spoken of the characters and properties of stones, when he comes next to consider the different kinds of earths, he mentions, as a very peculiar one, that, "which mingled with copper is capable not only of melting and blending with it; but has the extraordinary property of changing and improving its color."[5] Pliny repeatedly speaks of Cadmia; but it is evident that he does not always mean one and the same thing. Cadmia seems to have signified with him not only our calamine; but a copper ore which contained zinc; and the same

[1] Steph. de Urbibus, word Andeira.
[2] See Hardouin on Pliny, vol. 9, p. 195. [3] Hygini Fab. 272.
[4] See ante. p. 35.
[5] Theoph. c. 84.

name was extended to what the Germans call *ofenbruch*, furnace calamine; which in melting ores that contain zinc, or in making brass, falls to the bottom of the furnace, and contains more or less of calcined zinc.[1] There is little reason to doubt that the varieties of Cadmia, which Dioscorides calls ὀστρακίτις, πλακώδης, and βοτρυίτις, were also furnace calamine. Pliny certainly speaks of them as such; and describes together with them a fourth variety which he calls capnitis.[2] The contrary opinion of Saumaise is founded on what Beckmann seems justly to regard as an annotation that has been admitted into the text of Dioscorides.

The pompholyx, and spodos, of Dioscorides,[3] and Pliny,[4] were oxides of zinc, more or less pure, produced by combustion of the calamine in the process of making brass. There was no essential difference between the two; but spodos was the heavier, and of a darker color; being less completely oxidized; or less perfectly sublimated, and intermixed with impurities from the walls and pavement of the furnace. Pompholyx was the white oxide called flowers of zinc, or lana philosophica; and is compared by Dioscorides also to carded wool.[5]

A sulphuret of Antimony, called στίμμι by the Greeks, and stibium by the Romans, was from the earliest times, and still is used in the East for ting-

[1] Beck. Hist. of Inv. v. 3, pp. 70, 72. [2] Plin. 34, 22.
[3] Dioscor. 5, 85. [4] Plin. 34, 33. [5] Dioscor. 5, 85.

ing black the hair and eye-brows, the eye-lashes and edges of the lids: this last application being with a view to increase the apparent size of the eye, whence it was sometimes called πλατυόφθαλμον. The use of this cosmetic is twice spoken of in Scripture; at least according to the Seventy; for our version has not in either passage[1] specified the kind or color of the paint employed. Pliny's description of stibium[2] does not suit in all respects the common sulphuret of antimony; but this mineral may have been found then more frequently associated, as it now sometimes is, with the white oxide, or with the nickeliferous sulphuret; to either of which Pliny's description of it as "candida nitensque" might be with propriety applied. In preparing it as a paint, it is, according to Dioscorides,[3] to be enclosed in a lump of dough, and that buried in coals until reduced to a cinder. Extinguished with milk and wine, it is to be again placed upon coals, and blown until ignition; but if burnt longer it becomes lead (μολιβδοῦται.) Pliny directs cowdung to be used, in place of dough; and varies so entirely from the recipe of Dioscorides that it is evident he had some other authority before him, yet he too recommends, as especially necessary, to observe moderation in burning it, lest it should be converted into lead, (ne plumbum fiat.)[4] The fair inference from these passages ap-

[1] 2 Kings, ix, 30. Ezekiel xxiii, 40. [2] Plin. 33, 33.
[3] Dios. 5, .99. [4] Plin. 33, 34.

pears to be, that the ancients occasionally saw antimony also reduced to its metallic state; but, as in the case of zinc,[1] confounded it in a loose and careless way with another metal, better known to them.

METALLIC SUBSTANCES, EARTHS, &C., EMPLOYED AS PIGMENTS BY THE ANCIENTS.

Colors are divided by Pliny into bright, and dull, (floridi et austeri.) The florid or bright pigments are those with which the employer furnishes the artist; as minium—armenium—cinnabari—chrysocolla—indicum—purpurissum.' Other colors are austere, or dull. Pigments are again divided into native, as sinopis—rubrica—parætonium—melinum—eretria—auripigmentum; and factitious; of which, also, diverse kinds are specified.[2]

Κιννάβαρι. Theoph. c. 103. ἄμμιον. Dioscor. lib. 5, c. 109, 110. Minium. Vitruv. lib. 7, c. 8, 9. Plin. lib. 33, c. 40.

This pigment was, as we learn from Theophrastus,[3] either native or factitious. The native came from Spain and Colchis, rough and stony; the factitious from a single place not far from Ephesus. The process of preparing it, from a bright scarlet sand there found, is described by Theophrastus as the invention, about ninety years before his time,

[1] See Ante, p. 49.

[2] Plin. 35, 12.

[3] Here, and in all that follows respecting ancient pigments, a general reference to Theophrastus, Dioscorides, Vitruvius or Pliny, is intended as a reference to that portion of their works cited at the beginning of each article respectively.

of one Callias, an Athenian, who was led by the shining appearance of this sand to expect gold from it; a hope which its unusual weight may have contributed to encourage. This Ephesian κιννάβαρι of Theophrastus, which by Vitruvius and Pliny is called minium, we are perfectly sure, from what Vitruvius says, was sulphuret of mercury. That, however, Dioscorides calls ἄμμιον, and appropriates the name κιννάβαρι to a substance brought from Lybia, which some, he says, thought to be dragon's blood. Arrian and Pliny speak of an Indian cinnabar, which the former, correctly enough, describes as the inspissated tear-drop, as it were, of trees, while the latter regards it as the mingled and concreted blood of a dragon, and a dying elephant crushing the serpent by its weight. From this strange notion has been derived the vulgar name of dragon's blood; sometimes applied to reddle, and sometimes to a dark red resin imported from the East Indies; the substance which Arrian intended to describe.

Minium was a pigment highly valued, and even held sacred among the ancients. With it were painted the statues of the gods, and the persons of those who triumphed.[1] The titles of books also, at a somewhat later period, as well as the initial and more important letters, were decorated, and rendered more conspicuous by means of it, and those who were employed in doing this were, from

[1] Plin. 33, 36. Winckelmann, Stor. delle A. del Dis. v. 1, p. 16. Pausan. p. 115, and Kuhn's note thereo'n.

their use of minium, called *miniatores*. The word miniature is probably derived from this practice of illuminating the initial letters in manuscripts; there *miniaturæ* being originally monochromata; for which, wherever painted, the ancients commonly made use of minium.[1]

In Pliny's time minium, though found elsewhere, was brought from scarce any place but Spain; whence native cinnabar, to the amount of about ten thousand pounds weight annually, was sent under seal to Rome; where the exclusive privilege of manufacturing vermilion seems to have been enjoyed by a company which, not content with its fair profits, derived a further gain from various adulterations of the genuine pigment.[2] The fraudulent substitute for minium, spoken of by Pliny as found in almost all silver and lead mines, and prepared by burning thoroughly the stone intermixed with the silver ore, was probably red lead.

Μίλτος. Theoph. c. 91—95. Dioscor. lib. 5, c. 111, 112. Rubrica. Vitruv. lib. 7, c. 7. Plin. lib. 35, c. 13, 14.

This more common red pigment among the ancients was the ochrey red oxide of iron. The best,

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[1] Winck. Stor. delle A. del Dis. v. 2, p. 60. Plin. 33, 39. Our word *rubric* has a like origin with that suggested for *miniature*; the red oxide of iron, called *rubrica*, having been used as a substitute for minium to illuminate initial letters. Hence several (Sat. 14, v. 192,) calls the laws of the ancients *rubras*, and Persius (Sat. 5, v. 90,) speaks of Massurii rubrica.

[2] Plin. 33, 40.

Theophrastus says, was that of Cea; but the Lemnian and the Sinopic too, were celebrated. The latter was found in Cappadocia, and carried down to Sinope, and thence derived its name; which was often applied to the like substance from whatever country it might have been obtained. This red ochre was found varying considerably as to compactness, fineness, and intensity of color; and passing sometimes into reddle and bole. The terra Lemnia, or sigillata, was bole;[1] and is sometimes distinguished from the *rubrica* of the same island; which is the kind of rubrica preferred by Dioscorides and Pliny. The terra Lemnia (which, differing little from rubrica, is regarded by Pliny as the same) was never sold unsealed, and was therefore called σφραγὶς, terra sigillata, the sphragide of Jameson. It was stamped before the time of Dioscorides[2] with the figure of a goat; afterwards, in Galen's time, with the image of Diana; and has been of later years, with the seal of the Turkish empire. It was formerly much used in medicine as an astringent.

From Egypt and Carthage was obtained an inferior kind of μίλτος, or rubrica, used by carpenters.[3] Who for coloring their line made use of red more commonly, but sometimes black;[4] and not of white as we do. Accordingly, a white line being one that made no mark, to use a white line,

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[1] Cleav. Min. p. 473. [2] Dios. 5, 113. [3] Ibid.
[4] Eustath. in Hom. Od. ε. ν. 245.

λευκὴ στάδμη, was a proverbial expression for *to act without discernment.* This more common or cheaper red ochre was sometimes made by burning yellow ochre. Which was the discovery, Theophrastus says, of one Cydias; who, where a certain inn had been consumed by fire, saw half burnt yellow ochre converted into red. Both Theophrastus and Vitruvius[1] describe the mode of preparing this red pigment, which the latter writer and Pliny call *usta;* though Pliny comprehends under the same name, *usta,* another common red pigment, red-lead; discovered, as the last mentioned was, accidentally, from jars containing white lead (cerussa) having been exposed to the heat of a conflagration in the Piræus.[2]

Σανδαράχη. Theoph. c. 71. Dioscor. 5, 122.
Sandaraca. Plin. 35, 22. Vitruv. 7, 7.

This red pigment was the sulphuret of arsenic called realgar. An adulterate kind of it was made, Pliny says, of calcined white lead, that is, the red lead he had just before described under the name *usta* was substituted for realgar. But Vitruvius prefers to the native sandaraca this substitute; which he designates by no other name; simply saying that cerussa is by the heat of a furnace converted into sandaraca. A mixture of sandaraca with rubrica, in equal proportions, made the paint called sandix; and a further addition of sinopis produced that called syricum.[3] Strabo

[1] Vitruv. 7, 11.
[2] Plin. 35, 20.
[3] Plin. 35, c. 23, 24.

speaks[1] of a mine of sandaraca at Pompeiopolis, in Paphlagonia; in which, because of the dangerous exhalations from the mineral, none other were employed but slaves, who had been sold on account of crime.

Purpurissum, a red pigment which, because of its great cost, was furnished by employers,[2] was composed of creta argentaria dyed in a decoction of hysginum,[3] or of madder; as Dutch pink is made by combining with clay or marl the coloring matter of woad, or that obtained from the berries of the yellow leaved buck-thorn (rhamnus infectorius.) The creta spoken of by Pliny[4] and by Vitruvius,[5] as the basis of purpurissum, armenium, cœruleum, factitious chrysocolla, and other pigments, was generally an argillaceous earth. It may, however, sometimes have been chalk, if indeed the Greeks and Romans were acquainted with the use of chalk. It is very probable, moreover, that it was in some cases a white talc, like that called chalk of Briançon; which, when reduced to a fine powder, and colored with the flowers of the carthamus tinctorius,[6] is still used, as the purpurissum of the Romans was,[7] to give an artificial bloom to the complexion.

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[1] Strabo. p. 562. [2] Plin. 35, 12.

[3] A crimson dye-stuff, made from the insect found on the plant called ὑσγη.

[4] Plin. 35, 26. [5] Vitruv. 7, 14.

[6] Bastard saffron.

[7] Plaut. Mostell. 1, 3, 104. Trucul. 2, 2, 35.

Ωχρα. Theoph. c. 115. Dioscor. 5, 108. Sil. Vitruv. 7, 7. Plin. 33, 56.

Yellow ochre, which the Greeks called simply ὤχρα, and the Romans *sil*, appears to have been the principal yellow pigment of the ancients. Pliny specifies three varieties: the Attic, which was best; the marmorosum, which may have been what we call stone ochre; and the Syricum, of a dull color, named from the island Syros; as may have been the red paint also, called by the same name. Sil was found in many places, Vitruvius observes, but the Attic, which used to be the best, was no longer to be obtained; because the veins of it, which occurred in the silver mines of Attica, were no longer now explored. It is described by Dioscorides as light, smooth, free from stone, friable, and of a full bright yellow; and probably any ochre possessed of these qualities continued in Pliny's time to be called Attic. Theophrastus[1] speaks of painters using ochre (ὤχρα) instead of orpiment (ἀρρενικόν) because, however they might seem to differ, there was in fact no difference of color.

Polygnotus and Mycon were the first who painted with sil. The Attic, which they used, and that called lucidum, which came from Gaul, were afterwards employed for the lights of pictures; and the Syricum, the Achæan, and the Lydian for the obscurer parts.

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[1] Chap. 90.

Ἀῤῥενικον. Theoph. c. 71, 89, 90. ἀρσενικὸν Dioscorides 5, 121. Auripigmentum Vitruv. 7, 7. Plin. 33, 22. Arsenicum. Plin. 34, 56.

The yellow sulphuret of arsenic derives its name, orpiment, from one of its Latin appellations, auripigmentum, paint of gold; and it was so called, perhaps, not merely from its golden color, and the use to which it was applied, but because the ancients thought it really contained that metal. Pliny mentions, among other modes of obtaining gold, that of making it from orpiment; and says that Caius (Caligula) ordered a great quantity of that substance to be reduced, "and certainly obtained excellent gold, but in such small proportion as to lose by an experiment, which was not afterwards repeated." Although no great reliance can be placed on this account, we are not of necessity to regard it as a fable; for the mass experimented on may have contained, as it is said this mineral sometimes does, a small portion of gold.[1]

The Greek name ἀρσενικὸν (masculine) was given to this sulphuret because of the potent qualities it was discovered to possess. Qualities, which the present arsenic of the shops, a white oxide of the metal, exhibits in a more intense degree. The ancients were well aware of the kindred nature of this yellow sulphuret and the red sulphuret before

[1] Hill says he had a fine specimen of orpiment from the mines of Gosselaer, with veins of native sandarach running across it, which was brought to him as a gold ore; and which, he thought, really contained a small quantity of that metal. (Hill's Trans. of Theoph. p. 176.)

mentioned, called sandaraca. Theophrastus always mentions them together. Dioscorides observes that they are found in the same mine. Celsus, that they possess in all respects the same virtue;[1] and Pliny, that they are of the same substance. The two were then, in fact, as now, found occasionally intermixed. "There is a third kind, says Pliny, in which the golden color is mingled with the red."

Theophrastus and Pliny speak of both these minerals as found in gold and silver mines; and of orpiment, Pliny says, that it is dug in Syria, for the use of painters, near the surface of the ground; of a golden color, friable like the specular stone, (lapidum specularium modo) that is the laminæ were easily separable "like those of mica."[2] Vitruvius mentions Pontus as a locality; and Dioscorides names Mysia as the country whence the best was brought; that of Pontus holding the second rank.

Massicot, the yellow oxide of lead, which Sir H. Davy thinks was used as a pigment by the ancients,[3] may have been comprehended by them under the name chrysitis, one of the three varieties of litharge (λιθάργυρος) described by Dioscorides,[4] and by Pliny,[5] who has copied him. Its name (χρυσῖτις) was, no doubt, derived from its be-

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[1] Cels. 5, 5.
[2] Cleav. Min. p. 679.
[3] See Ure's Chem. Dict. article "Paints."
[4] Dioscor. 5, 102.
[5] Plin. 33, 35.

ing, as Dioscorides describes it, yellow and shining, (ξανθὴ καὶ στίλβουσα) and, in so far, resembling gold. Though Dioscorides speaks only of its medicinal properties, yet, since the seven substances, which form the subjects of his seven next succeeding chapters, were all pigments, we may reasonably suppose chrysitis also to have been such.

Χρυσοκόλλα. Theoph. c. 46. Dioscor. 5, 104. Chrysocolla, Vitruv. 7, 9. Plin. 33, c. 26, 27, 28.

This was a green pigment much spoken of among the ancients, and has been with the moderns a subject of much uncertainty and doubt. It is probable that under the same term were comprehended malachite, copper-green, and various green earths. The name applied to those several substances properly belonged to a factitious compound, described by Pliny,[1] used in soldering gold. In this chrysocolla (gold glue) "which the goldsmiths claim as theirs," (aurifices sibi vindicant) the most important ingredient, perhaps, was the sub-carbonate of soda, (nitrum.)[2] The best chrysocolla, Pliny tells us, was procured from copper mines; the next best, from silver mines; the third quality, from gold mines; and that least valued, from lead mines. His description of it as a substance, which from a liquid flowing through mineral veins had become indurated, agrees well with

[1] Plin. 9, 29.

[2] Some have been so far mistaken as to suppose the chrysocolla of Pliny to be the sub-borate of soda, (borax,) now used by jewellers in soldering gold. (See Jameson's Mineralogy, 2, 350.)

the undulated appearance often presented by the surface of compact malachite; and its color, too, is that of malachite; being most approved, he says, when it resembled that of luxuriant corn, while in the tender blade. When used in medicine it excites vomiting, he says; and Dioscorides, too, observes, that it is one of the substances "which promote vomiting and can cause death." This author states that the best was brought from Armenia; the second kind from Macedonia; and the third from Cyprus.

Theophrastus speaks of "native cyanos containing chrysocolla,"[1] or, in modern terms, of the blue carbonate of copper containing, as it often does, the green; and Aristotle also, mentions that the two occur together in the island Demonesus.[2] Kidd agrees with others in thinking the chrysocolla of Theophrastus to be malachite; but supposes the Greek term to have, in this case, a passive signification; and to imply that the substance was "set in gold;" it being sometimes polished as an ornamental stone.[3] The impure ores of copper called by some mineralogists copper green, are by others, as Brongniart, Aikin and Phillips, denominated chrysocolla; and it is most probable that some of them were by the ancients comprehended under that name. As were also some of those green earths now known as mountain green,

[1] Theoph. c. 70.
[2] Arist. de Mirab. Auscult, v. 1, p. 1154.
[3] Kidd's Min. 2, 120.

or green earth of Saxony; from its being there obtained; as it is likewise at Kernhausen in Hungary; near Verona, in Italy; and in various parts of the United States.[1] Vitruvius speaks of a green earth, fit for the use of painters, found in many places, but the best at Smyrna.[2] Celsus speaks of viride Alexandrinum,[3] and Pliny of viride Appianum.[4] These earths differ considerably from place to place in their composition; but do not often contain copper, to which metal they were once supposed to owe their color. That the name chrysocolla was very loosely used is evident; for Pliny has described one kind obtained by the evaporation during June and July, of waters suffered to flow through metallic veins during the preceding winter, and until the month of June; and, if his text here were not corrupt, he would, probably, be found to describe another factitious kind in much the same way that Vitruvius does; who says that those who cannot use chrysocolla because of its high price, dye a blue pigment (cœruleum) with the herb called lutum, (which produced a yellow color) and thus obtain a lively green.

Ios. Theoph. c. 102. Dioscor. 5, 91. Ærugo. Vitruv. 7, 12. Plin. 36, 26.

Verdigris was among the ancients, as it still is, a common green pigment; and may be considered as belonging to our subject, seeing that Dioscorides and Pliny specify several varieties of native

[1] Cleav. Min. p. 445.
[2] Vitruv. 7, 7.
[3] Cels. 5, c. 26, § 23.
[4] Plin. 35, 29.

ἰός, or aerugo; classing with it, in this case, what we may suppose to have been green carbonate, instead of acetate of copper; as, for example, "the efflorescence upon stones which contained copper," and what was "scraped from the stone out of which copper was melted."

Various modes of making verdigris are described by Theophrastus, Dioscorides, and Pliny; which agree in principle, and some of them even as to their details, with the processes now used. Among the various adulterations of it, that made with the sulphate of iron (atramentum sutorium) was, as we learn from Pliny, the one best calculated to deceive; and the mode of detecting it, suggested by him, is deserving notice. It was to rub the counterfeit aerugo on papyrus steeped with the gall nut, which immediately thereon turned black.

Κυανὸς. Theoph. c. 98. Dioscor. 5, 106. Cœruleum. Vitruv. 7, 11. Plin. 33, 57.

Under these names were comprehended by the ancients several blue pigments, differing widely in their origin and nature. Theophrastus, having observed that cyanus (κυανὸς) is either native (φυσικὸς) or factitious (σκευαστὸς) as in Egypt; specifies three kinds; the Egyptian, the Scythian, and the Cyprian; of which the two last appear to have been native, and, in that case, were probably the blue carbonate of copper. What the Egyptian was has been a subject of much doubt. Some travellers have thought the blue, which may still be recognised in the paintings of Thebes, to be

ultramarine;[1] and Beckmann infers that the blue seen on mummies, having lost little or nothing of its brightness, must be either ultramarine or cobalt, but with the latter he thinks it can be shown that the Egyptians were unacquainted.[2]

Theophrastus speaks of the artificial cyanus as prepared by means of fire, (πεπυρωμένος) which agrees well with the idea of its being ultramarine; but so does it with the account which Vitruvius gives of this matter; an account which, it seems, might have settled all doubts had it received the attention it deserves. The composition of cœruleum, he says, was first invented at Alexandria;[3] and a manufactory of it afterwards established at Puteoli by Vestorius. It was made by reducing sand mingled with pure nitrum, (sub-carbonate of soda) to a fine powder; which, being sprinkled with coarse copper filings, was formed into balls and dried. The balls were then arranged in earthen vessels, and placed in a furnace until by its heat they were converted into cœruleum. Now this is precisely the cœruleum prepared by Sir H. Davy,[4] who found that 15 parts of carbonate of soda, 20 parts of opaque flint powdered, and 3 parts by weight of copper filings, strongly heated together for two

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[1] See Norden's Travels, v. 2, p. 51. [2] Hist. of Inv. 2. 360.

[3] There must be some inaccuracy here, if Vitruvius has in view, as is most probable, the Egyptian azure spoken of by Theophrastus; for he, writing about the time of the foundation of Alexandria, says, that "those who write of the Egyptian kings, mention the king who first made artificial azure in imitation of the native." c. 98.

[4] See Paris' Life of Sir H. Davy, v. 2, p. 48, 299.

hours, yielded a compound, which, when powdered, produced a fine deep sky blue, which he regarded as the same azure employed in some ancient paintings.[1]

As to the native azure, there seems little reason to doubt that it was generally, if not always, blue carbonate of copper.[2] Pliny observes[3] that it is found in gold and silver mines; and Theophrastus speaks of it as occurring together with chrysocolla, that is, with malachite. This blue carbonate was at one time much used in Persia as a pigment;[4] and is so used in some countries to this day.[5] Pliny mentions as other varieties of cœruleum, the Puteolanum, the Vestorianum, and the Hispanieuse. The first two we may infer, from what Vitruvius says, to have been the same with each other, and with the Egyptian; and the last, which seems, like the others, to have been factitious, probably differed from them only as to the place from which it came. The cœruleum styled Indicum, which Pliny speaks of as not long before his time introduced, was probably indigo.[6] We find from Dioscorides[7] and Vitruvius,[8] that it came from India; and the former, though he does not

[1] See Ure's Chem. Dict., article "Paints."—Sir H. Davy seems to differ from Beckmann, in supposing the ancients to have been acquainted with cobalt.

[2] Beck. Hist. of Inv. v. 2, p. 325, 329.

[3] Plin. 33, 56.

[4] Beck. Hist. of Inv. 2, 317.

[5] Cleav. Min. p. 568.

[6] See Schneider's Comment. on Vitruv. lib. 7, c. 9; and Beck. Hist. of Inv. v. 4, p. 103, 105.

[7] Dioscor. 5, 107.

[8] Vitruv. 7, 9.

describe it as a vegetable substance, supposes it to be a concretion about Indian reeds. Pliny, however, mentions as a test, by which the true cœruleum Indicum might be distinguished, its flaming upon coals; a property of cœruleum, which could not belong to such mineral substances as have heretofore been spoken of under that denomination.

Pliny says a fraudulent imitation of cœruleum was produced by a decoction of dry violets, strained through a linen cloth upon creta Eretria; and he speaks obscurely of still another factitious kind: which in Vitruvius[1] we find described more clearly, as an imitation of the Indian azure, obtained by dying creta Selinusia, or argentaria, with woad, the ἴσατις of the Greeks, called vitrum or glastum by the Romans.

Ἀρμένιον. Dioscor. 5, 105. Armenium. Vitruv. 7, 9. Pliny, 35, 28.

This blue pigment, called after the country whence it came, is described by Pliny as differing from cœruleum, in that it has a whitish tinge. The kind which by Dioscorides is esteemed the best, appears to have been an earth; for he requires it to be smooth, friable, and free from stone. It was, probably, the same mineral he speaks of in the next chapter, under the name *cyanus;* only that it was in an earthy form, and came from Ar-

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[1] Vitruv. 7, 14.

[2] Cleav. Min. p. 568.—Brongn. Tr. Elem. de C. 2, 221.

menia instead of Cyprus. In its medicinal effects it resembled chrysocolla; but was less efficacious. Besides this earthy blue pigment, there was also a stone called lapis Armenius; and this is thought to have been some quartzy or calcareous substance, penetrated by the blue carbonate of copper. Jameson says the Armenian stone of the ancients was a limestone impregnated with earthy azure copper ore, and in which copper and iron pyrites were sometimes disseminated.

Among the blue pigments made use of by the ancients, Jameson would include the earthy phosphate of iron, "for a substance answering to blue iron earth is mentioned by Pliny as being collected in the marshes of Egypt, and ground, and washed, and used as a pigment."[1]

Besides the several white earths employed as pigments by the ancients, they used also white lead, called ψιμύθιον, cerussa; and the mention of it here may be allowable, since Pliny speaks[2] as if there were a native kind that had at one time been in use, although when he wrote it was artificially prepared. The processes described by Theophrastus,[3] Dioscorides,[4] Vitruvius,[5] and himself, do not differ essentially from those now used. The substance spoken of by Pliny as a native ceruse,

[1] This is one of many instances in which the readers of Jameson find reason to regret that the learned professor has not referred them to the authority upon which he rests.

[2] Plin. 35, 19.

[3] Theoph. c. 101.

[4] Dioscor. 5, 103.

[5] Vitruv. 7, 12.

found at Smyrna, on the farm of Theodotus, appears to have been that greenish earth mentioned by Vitruvius[1] as occurring in many places, but the best near Smyrna,—and called by the Greeks Θεοδότιον, from the name of the person Theodotus, upon whose farm it was first discovered. From the fact, that this greenish earth was regarded as a sort of ceruse, we might infer that the ceruse of the ancients was not always of a very pure white.

Theophrastus, Dioscorides, Vitruvius, Pliny, and other ancient authors, speak of various earths used in medicine chiefly, or as pigments; and the second named of these writers specifies certain properties of these earths, that were possessed in common by them all.[2] Indeed, with the exception of *ampelite*, they seem to have resembled each other greatly in their supposed medicinal virtues, as well as in their external characters. Thus the Selinusian had the same effects with the Chian;[3] and this the same with the Samian.[4] The Pnigitis resembled in color the Eretrian, and was sold in place of it by some; and it possessed the same virtues with the Cimolian.[5] These earths were in most cases argillaceous; and by the term, creta, was generally meant some whitish clay, such as potter's clay, pipe clay, or fuller's earth. It was sometimes, however, applied to a calcareous marl, of which kind, probably, were the "candida fossi-

[1] Vitruv. 7, 7.
[2] Dioscor. 5. 170.
[3] Dioscor. 5, 175.
[4] Dioscor. 5, 174.
[5] Dioscor. 5, 177.—Plin. 35, 56.

tia creta," used in Gaul as a manure,[1] and the "creta pulvis," which Palladius recommends for the same purpose;[2] and we have reason to believe, that where such magnesian earths occurred as those varieties of talc and steatite, which we call French and Spanish chalk, the ancients comprehended them also under the name *creta*. That creta was clay we might infer from the uses to which it was applied; but we are besides expressly told it was so, by the writers "De Re Rustica," and others. "Creta, quam argillam dicimus," says Palladius.[3] "Creta, qua utuntur figuli, quamque nonnulli argillam vocant," says Columella.[4] These writers speak repeatedly of "creta figularis,"[5]—"creta qua fiunt amphoræ."[6] Celsus, too, speaks of "creta figularis,"[7] and Vitruvius of "vas ex creta factum, non coctum."[8]

One of the most celebrated of those earths was the creta Cimolia; much used both in medicine, and as a fuller's earth for scouring and cleansing woollen cloths. Both uses of it seem to have been more ancient at least than the age of Hippocrates; for he, more than once, prescribes[9] detersive earth (σμηκτρίδα γῆν), which Erotianus and Galen explain to mean Cimolia (τὴν Κιμωλίαν). This earth, which anciently gave celebrity to Ci-

[1] Varro. 1, 7, 8.
[2] Feb. 25, 22.
[3] Pallad. 1, 34, 3.
[4] Colum. 3, 11, 9.
[5] Col. 3, 11, 9.—6, 17, 6.—8, 2, 3.—Veg. 3. 4.
[6] Col. 12, 4, 5.
[7] Cels. 1, 3.
[8] Vitruv. 8, 1, 5.
[9] Hippocr. Op. p. 667. 1.—p. 684. E.

molus,[1] still forms beds in that island, now called Argentiera, and in Milo. It was in modern times first recognised by Tournefort;[2] and is now called by mineralogists cimolite, argile cimolithe. It is greyish white; but by exposure to the air, becomes reddish; whence, probably, is derived Pliny's distinction of it into two kinds, "candidum, et ad purpurissum inclinans."[3] It possesses the detergent property of fuller's earth, but is less unctious to the touch than that variety of clay. Mr. Hawkins found that the terra cimolia which he procured at Argentiera, cleansed woollens as well as the best fuller's earth. The inhabitants of the island still use it, not only for this purpose, but as a substitute for soap in washing linens; though from what Tournefort observes, it seems badly suited to such use, inasmuch as the grains of sand which it contains are apt to wear away the linen.[4] The name cimolia was applied to other earths besides that of the island Cimolus; from their possessing, in greater or less degree, its detersive properties. That of Sardinia Pliny styles, "vilissima omnium cimoliæ generum,"—the cheapest kind of cimolite. This creta Sarda was, however, used in the first place to cleanse garments that were not dyed, which were then fumigated with sul-

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[1] "Hinc humilem Myconen, cretosaque rura Cimoli." Ov. Met. 7, 463.

[2] Jam. Min. 1, 478. [3] Plin. 35, 57.

[4] Brongn. Min. 1, 519.—Tournefort's Voyage, v. 1, p. 113, Eng. trans.

phur, and finally scoured with cimolia.[1] We perceive, therefore, that when "cretata vestis," "cretata ambitio candidati," are spoken of, we are not, as some have done, to fancy that the gown of the candidate was whitened with a sprinkling of powdered *chalk;* but that it was cleansed, and brightened by the fuller's art.

The first of the earths enumerated by Pliny, collyrium, is still represented in our cabinents by the kollyrite, argile kollyrite; and of the last one in his arrangement, and in that of Dioscorides, ampelitis, we retain the name; under which some mineralogists have included aluminous and graphic slate.[2]

The ampelitis appears to have been a bituminous shale; and is called by Strabo "the bituminous earth ampelitis" (τὴν ἀμπελίτιν γῆν ἀσφαλτώδη).[3] This earth was found near Seleucia in Syria; was black, and resembled small pine charcoal; and when rubbed to powder, would dissolve in a little oil poured upon it. Its name was derived from its being used to anoint the vine (ἄμπελος), and preserve it from the attack of worms.[4] The Cilician earth spoken of by Theophrastus,[5] which, when boiled, became viscid, and with which, instead of

[1] Plin. 35, 57.

[2] Brongniart (Min. 1, 561,) agrees with Messrs. Romé-de-Lille and Haüy in thinking ampelitis to have been the same with the minerals which he describes under the names ampelite alumineux and ampelite graphique.

[3] Strab. p. 316.

[4] Dioscor. 5, 181.

[5] Theoph. c. 85.

birdlime, vines were anointed to guard them against insects, was probably of this same kind.

Collyrium was so called from its supposed virtue as an external application to sore eyes;[1] such remedies being called collyria. It was one of the two more remarkable varieties of Samian earth, the other of which was called aster. The rest of the earths had their several names from the places where they respectively occurred. The Selinusian was sometimes called argentaria, because used to polish silver. The earth spoken of in connexion with Selinusian, and called annularia, which was stained with woad to produce an imitation of indicum,[2] is probably the same with the annulare (viridum) mentioned afterwards;[3] which was so called because made of clay, colored with common green ring stones. This at least, strange as it is, appears to be the only sense we can extract from Pliny's words; the meaning of which Beckmann acknowledges he had not been able to discover.[4] The same author inclines to think that the earth called annularia received its name from its use in sealing; a purpose to which certain kinds of earth were anciently applied.[5] The Pnigitis was probably obtained from the neighborhood of a village called Pnigeus, on the coast of Egypt, not far from which was a promontory of

[1] Plin. 35, 53. [2] Plin. 35, 27.
[3] Plin. 35, 30. [4] Beck. Hist. of Inv. 4, 106.
[5] See Herod. 2, 38.—Cic. pro Flacco. c. 16.—Beck. Hist. of Inv. 1, 208.

white earth, called the White coast (Λεύκη Ακτή).[1] Nearly related to Pnigitis was Paraetonium; one of the earths most commonly made use of as a white pigment,[2] and which derived its name from a town in Egypt, where it was obtained, not far from Alexandria. It was a heavy tough clay, of a fine white color; and in the mass often contained minute shells and other impurities; owing, probably, to its having been rolled by the waves upon the beach, after being washed in a purer state out of sea-beaten cliffs, in which strata of it were contained. It was procured from Cyrene also, and from Crete;[3] and, Hardouin says, is found in Saxony, and known by the same name.[4]

Melinum, or terra Melia, was so called from the island Melos (Milo,) where it was obtained. It was of an ashy white, resembling the ash colored Eretrian earth; and was useful in painting, to give permanence to colors.[5] One of the several varieties of Samian earth resembled it; but, being unctuous, stiff, and slippery, was not employed by painters.[6] The Melian was applied to the same uses in medicine as the Eretrian earth.

Theophrastus, speaking of factitious pigments, adds that there are three or four varieties of native

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[1] Strabo, p. 799.
[2] Vitruv. 77.—Plin. 35, 18.
[3] Plin. 35, 18.
[4] Hard. in Plin. vol. 9, p. 414.
[5] Dioscor. 5, 181.—It was also used by women as a cosmetic, and seems to have answered the same purpose as the ceruse which is mentioned with it. (Plaut. Mostell. 1, 3, 107.)
[6] Theoph. c. 108.—Plin. 35, 19.

earths, which from their superior usefulness deserve mention, and he specifies the Melian, the Cimolian, the Samian, and the Tymphaican; which last he further characterizes as gypsum. Of these the Melian alone, and such others as possessed its qualities; that is, the opposite of those above ascribed to Samian earth, were used by painters.[1] There were in Melos, and in Samos, many varieties of earth. The Samian was obtained from a vein of considerable extent, but only two feet in height between the rocks which formed its roof and floor; so that one could not stand erect while digging it, but was obliged to lie upon his back or side. This vein contained four different qualities of earth, which became better in proportion as it was obtained from nearer the centre of the vein; the outer and inferior kind called aster being chiefly or solely used for cleansing garments.[2] Such of these white earths as were used for pigments resembled, probably, the clays still so employed under the names of Spanish white—white of Moudon, or Morat—and Rouen white.[3] The Tymphaic earth was an earthy gypsum, found near Perrhæbia, and Tymphæa, in Ætolia,

[1] Theoph. c. 107.

[2] Some suppose one variety of Samian earth to have been Meerschaum, and that of this were formed those celebrated Samian vessels spoken of by Pliny (35, 46,) by Plautus (Capt. a. 2, sc. 2,) and repeatedly by Cicero (ad Her. 4, 65.—In Verr. 1, 50.)

[3] See Tingry's Painter's and Varnisher's Guide, p. 181, seqq.

on the surface of the ground; and was used in cleansing garments.[1]

OF MARBLES, AND OTHER MINERAL SUBSTANCES, EMPLOYED IN BUILDING, &C. BY THE ANCIENTS.

Among the marbles enumerated by Theophrastus and Pliny, that ranks first with both, which, from the island Paros where it was obtained, was called Parian; and from the manner in which it was quarried, by the light of lamps, was sometimes, as Pliny on the authority of Varro tells us, designated by the name lychnites.[2] This is the stone "whose color was considered as pleasing to the gods,[3] which was used by Praxiteles, and other illustrious Grecian sculptors,[4] and celebrated for its whiteness by Pindar[5] and Theocritus."[6] Of this marble are the Venus de'Medici, the Diana Venatrix; the colossal Minerva, (called Pallas of Velletri;) Ariadne, (called Cleopatra;) Juno, (called Capitolina,) and others. Of this are also the celebrated Oxford marbles, known as the Parian Chronicle. Before Pliny's time, however, whiter marbles than the Parian had been discovered, and amongst them the Lunensian, (marmor Lunense,) which derived its name from the city Luna in

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[1] Theoph. c. 111.—Plin. 36, 59.

[2] From λύχνος a lamp.—Plin. 36. 4. 2.

[3] Plat de Leg. 12. 7. [4] Prop. 3. 9. 16. Quinct 2. 19.

[5] Pind. Nem. 4. 131.

[6] Theocr. 6. 38.—See Clarke's Trav. v. 6, p. 133.

Etruria, where it was obtained.[1] The same marble, now quarried at Carrara, a few miles distant from its ancient source, is the one chiefly used by modern sculptors; and furnished the material for some fine specimens of ancient art likewise; as the Antinous of the Capitol, and the Belvidere Apollo, according to Jameson, Dolomieu and other mineralogists; though Dr. Clarke thinks them to be Parian marble.[2]

The Pentelican marble, which Theophrastus names next after the Parian, was obtained from mount Pentelicus, not far from Athens; and many of the finest works executed there during the administration of Pericles are of this material. The Parthenon was built entirely of it, as was also the temple of Ceres at Eleusis.[3] But being less homogeneous than the Parian marble, and consequently more liable to decomposition, the works executed in it do not, like those in Parian marble, retain the mild lustre of their original polish.

The Chian marble, which stands third in Theophrastus, was sometimes, as we may from what Pliny says infer, diversified with colored spots;[4] while from another passage in the same author, read correctly, it appears that the Lucullean marble, which was of a uniform black, came from

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[1] Plin. 36, 4, 2.

[2] The author of "Rome in the 19th Cent." says the Belvidere Apollo, "is now universally recognised to be of Italian marble."

[3] Clarke's Travels, vol. 6. p. 133, seqq. [4] Plin. 36, 5.

Chios.[1] And this pure black marble is, indeed, the kind most commonly spoken of as Chian; though it is not improbable that the island produced marble of several different sorts.

Beckmann thinks[2] that Theophrastus, by the carbuncle (ἀνθράκιον) of Chios,[3] meant this well known black marble, which from its resemblance to an extinguished coal, was designated by this name; as the ruby was, from its resemblance to one burning. And of this marble he supposes to have been made the mirrors mentioned by Theophrastus; and that Pliny[4] misinterprets him in stating they were of the (ἀνθράκιον) of Orchomenus. The Thebaic, which is the only other marble that Theophrastus names, is not mentioned by Pliny; for the Thebaic stone (lapis Thebaicus) and the Syenites of the Thebais were not marbles, as we shall hereafter see.

Pliny deems it unnecessary to describe the kinds and colors of marbles, seeing they were so well known; and not easy to enumerate them, from their multitude.[5] We are now at a loss to determine even some of those he has thought fit to specify. We know that he includes among marbles, some stones not strictly such; as porphyry, basalt, and syenite; and we are, therefore, justified in doubting as to others. Thus the Coraliticus

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[1] Plin. 36, 8.—The true reading appears to be "Chio Insula," instead of Nili Insula.—See Hardouin on Plin. 36, 8.

[2] Beck. H. of I.,3 178.

[3] Theoph. c. 61.

[4] Plin. 37, 25.

[5] Plin. 36, 11.

whose dimensions never exceeded two cubits,[1] would seem not to have been marble. If, however, it was, as some suppose, a snow-white fine-grained marble, which had its name from the river Coralus in Phrygia, Pliny must mean that it was not obtained from the quarry in masses of larger dimensions than those he has assigned to it. The Alabandicus, which, "liquatur igni ac funditur in usum vitri,"[2] is thought by some to have been marble used as a flux in making glass, while others have supposed it to be manganese.[3]

The Lacedæmonian green marble, which Pliny classes with the most precious, was quarried at Taenarus; and the verde antico is supposed to be the same.[4] There are Egyptian green and white marbles still known, which are taken to be those Pliny calls Augustum and Tiberium. The ophites, with which Pliny compares them, is called in later writers Egyptian ophite, green Egyptian marble, and Egyptian green. It is thought by some a variety of common serpentine. Others describe it more accurately as a mixture of reddish brown common serpentine, leek and pistachio green precious serpentine, white granular foliated limestone, and small portions of diallage.[5]

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[1] Plin. 36, 13. [2] Ibid.

[3] Beck. Hist. of Inv. 4, 60.

[4] Winck. Stor. delle A. del Dis. v. 1, p. 23.—Sext. Empir. Op. p. 34, and the authors there cited by H. Stephens.

[5] Jam. Min. 1, 514. This appears to be the stone described by

Of the ophites there are three varieties specified by Dioscorides;[1] one, black and heavy; a second, ash colored and spotted; the third, containing white lines. The first was perhaps green porphyry, the ophites of Waller;[2] the second, steatite, and the third, the kind just now described. Pliny seems to have in view the first two of these three varieties, when he says, there are two kinds of ophites, the one soft and white, the other dark colored and hard.[3] Afterwards speaking of a mortar for the physician's use made of the white ophite, he adds, "est enim hoc genus ophitis ex quo vasa etiam et cados faciunt."[4]

When luxury and the rage for building were at their height in Rome, every accessible region of the earth was ransacked for materials; and from the continent and islands of Greece, from Numidia and Egypt, from Phrygia, and other parts of the coast of Asia Minor, the finest marbles were procured. Among these were celebrated the Hymettian, from mount Hymettus in Attica; the Carystian, from Eubœa; the white marbles of Cappadocia and Thasos; the black of Lesbos, and the marbles of Numidia, a country which, as Pliny asserts, produced nothing whatever remarkable, except marble and wild beasts.[5] That quar-

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Winckelmann under the name of Egyptian breccia. (See Stor. delle Arti del Dis. v. 1, p. 89.)

[1] Dioscor. 5. 162.
[2] Waller. Syst. Min. 1, 430.
[3] Plin. 36, 11.
[4] Plin. 36, 43.
[5] Plin. 5, 2.

ried near Synnada in Phrygia, resembling alabaster in its variegated appearance, was much used at Rome in Strabo's time; and slabs and columns of extraordinary size and beauty were brought from that great distance.[1] It is natural, therefore, that among the ruins of Roman architecture should be found marbles of which the quarries are no longer known, and which are therefore designated as antique. Such are the verde antico, the rosso antico, the giallo antico, the bianco e nero antico, besides others. The porphyrites, basaltes, and syenites of Egypt, described by Pliny, still retain their ancient names. Of this last material, which was quarried near Syene, a town of Thebais, were formed those celebrated obelisks described by Pliny,[2] and which are still gazed at with wonder, either in Egypt, or at Rome. This stone is classed by Winckelmann with granite; of which he says Egypt furnished two varieties, one red and whitish; of which are formed these obelisks, and many statues; as three of large size in the Capitoline museum; the other white and black, peculiar, as he thinks, to Egypt, and of which there is a statue of Isis in the same museum, and a large figure of Anubis in the Villa Albani.[3] Pliny speaks of fine works of art in Egyptian basalt also, and of these likewise some have found their way to Rome; as the lions at

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[1] Strab. p. 577. [2] Plin. 36, 13.
[3] Winck. St. delle A. d. D. v. 1, p. 85—v. 2, p. 13.

the base of the ascent to the Capitol, and the sphinx of the villa Borghese. Of this stone also, Winckelmann distinguishes two kinds: the black, which is the more common sort, is the material of the figures just now mentioned; the other variety has a greenish hue.[1]

The stone which Pliny describes as possessing the hardness of marble, white, and translucent, and thence called phengites,[2] is supposed to have been selenite.[3] Of this stone Nero built a temple of Fortuna Seia; within which, "when the doors were closed, there remained the light of day; which seemed, not transmitted, as through the specular stone; but, as it were, enclosed within the walls."[4] Hardouin, in his note upon this passage, says, the church of St. Miniat in Florence is lighted in like manner, by windows of selenite fifteen feet in height. And it was thus, as Beckmann thinks, that selenite was used in the temple of Fortune; the openings in the walls were closed, and not the whole building constructed with it.[5] Domitian, that he might be able to see what was done behind his back, lined with this same substance a gallery in which he used to walk.[6]

The tophus of Pliny[7] was a calcareous tufa; which, in some places a firm and durable material

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[1] Ibid.
[2] From Φέγγος, splendor.
[3] Jam. Min. 2, 241.
[4] Plin. 36, 46.
[5] Beck. Hist. of Inv. 3, 175.
[6] Suet. in vita Domit. c. 14.
[7] Plin. 36, 48.

for building, was elsewhere, as at Carthage, of so spongy and friable a nature, that it could not, without some protection, bear exposure to the weather; so that the Carthaginians, who had no other building material, used to coat their walls with pitch. A variety of calcareous tufa, which, though lighter than Parian marble, resembled it in hardness and in color, was called by the Greeks πῶρος or πώρινος λίθος, as it is by Pliny also, when translating from Theophrastus.[1] Of this stone were constructed the temple of Jove at Elis,[2] and that of Apollo at Delphi;[3] except that the roof of the former was of Pentelican, and the front of the latter of Parian marble. Indeed, porus seems to have been as usual a building material in Greece, as the like substance, travertino, (lapis Tiburtinus,) was in Italy;[4] and these varieties of calcareous tufa were the first stones upon which the statuaries of Greece and Italy exercised their art.[5]

The lapis Tiburtinus (travertino) appears to be classed by Vitruvius[6] and Pliny,[7] as it generally is by moderns, with calcareous tufa; though some have preferred to regard it as a compact limestone.[8] Of this material are the ruins of Pæstum;

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[1] Plin. 36, 28.
[2] Pausan. p. 397.
[3] Herod. 5, 62.
[4] See Winck. St. delle A. d. Dis. v. 1, p. 22.
[5] Ibid.
[6] Vitruv. 2. 7.
[7] Plin. 36, 48.
[8] That it was limestone we should know from Palladius, who speaks of it (1, 10, 3,) as being capable of being burnt to quicklime.

the Coliseum, and St. Peter's in Rome, with many other churches, and buildings, ancient as well as modern. It is a stony concretion of a spongy nature, and is formed especially in the waters of the Teverone. In the quarries of it fresh stone forms, in which tools are sometimes found imbedded.[1] There is an example of a like extensive formation of tufa near Guanca Velica in Peru; where a warm spring deposites calcareous earth in such abundance as to form quarries, from which building materials are drawn.[2] Limestone of this kind acquires a great degree of hardness; and it has been thought that the solidity of Roman masonry is due to the joint use of travertino and puzzolana, which are found in the same neighborhood.[3]

That puzzolana, mixed with a small proportion of lime, hardens quickly, even under water, was well known to the ancients. Vitruvius, Pliny, Seneca, and others speak of this property of the pulvis Puteolanus as a curious fact.[4] The black sand, which Vitruvius calls carbunculus; and supposes to have been produced by subterranean heat; was, probably, the black variety of puzzolana; which some mineralogists regard as altered scoria.

The existence of such subterranean heat Vitruvius thinks is evidenced in various ways; as by

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[1] Kidd's Min. 1, 25. [2] Brongn. T. E. de Min. 1, 212.
[3] Ibid.
[4] See Vitruv. 2, 6.—Plin. 35, 47.—Senec. Nat. Quæst. 3, 20.

warm springs; by hot vapors issuing from hollow mountains; by ancient traditions of the effects of such heat; effects which, he thinks, must vary with the nature of the soil; wherefore the same heat produced in Campania the dust (pulvis) called Puteolanus, and in Etruria that sand called carbunculus.[1] The pulvis Puteolanus was obtained from the region round about Vesuvius, and especially near Baiæ and Puteoli; now called Puzzuoli; whence its modern name.

That stone into which earth from the neighborhood of Cyzicus and Cassandria, when immersed in the sea, was converted, as Pliny tells us;[2] as also that along the coast from Oropus to Aulis, where the earth, as far as it was washed by the sea, was changed to rock, may have been a sort of calcareous tufa, somewhat like that on the coast of Guadaloupe, which contained the supposed fossil human bones. And the spring in Cnidus, which in eight months converted earth into stone, was probably impregnated with carbonate of lime to such degree as to produce effects like those exhibited at Carlsbad in Bohemia; at the hot baths of St. Philip in Tuscany; or, in ancient times, near Hierapolis in Phrygia; where, as Vitruvius informs us,[3] was a copious hot

[1] Vitruv. 2, 6, sub fin. It should be remembered that Vitruvius wrote before the first eruption of Vesuvius, of which we have any historic record; that by which Herculaneum and Pompeii were destroyed.

[2] Plin. 35, 47.

[3] Vitruv. 8, 3, 10.

spring, the waters of which, introduced into trenches cut around gardens and vineyards, formed after a year a crust of stone. A property, of which the inhabitants who dwelt thereabout took advantage, in order to form inclosures for their fields.

Strabo, too, speaks of these waters of Hierapolis, "which were so easily indurated into calcareous tufa (πῶρος) that, by conducting them through channels, hedges were formed of one entire stone."[1]

The silices, of which certain kinds are specified by Pliny[2] as fit to be used in building, may in some cases have been such as we also term siliceous; but the more probable opinion is, that the name silices was somewhat indiscriminately applied to the more compact and harder stones.

The viridis silex, which so remarkably resisted fire; which was never abundant; a stone rather than a rock; may perhaps have been serpentine. No inference to the contrary need be drawn from Pliny's calling it silex; for he presently after speaks of lime made "ex silice;"[3] as Vitruvius, also, directs that it be burnt "de albo saxo aut silice."[4] It is probable that by silex in these passages is meant a dark colored compact limestone.

The red stone which Pliny,[5] after Vitruvius,[6] recommends to expose to the weather for two years before it is used in building; in order that such

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[1] Strab. p. 629.
[2] Plin. 36, 49.
[3] Plin. 36, 53.
[4] Vitruv. 2, 5.
[5] Plin. 36, 50.
[6] Vitruv. 2, 7.

stones only may be employed in the superstructure as have been able to abide this test, may have been a red sand stone; different varieties of which differ greatly as to their durability when so exposed. Some, as that from Nyack on the Hudson, absorb moisture and fall to pieces; while others, again, as that from Newark on the Passaic, become harder by exposure to the weather.

Pliny specifies various kinds of sand used in sawing marble; of which the best were the Æthiopic and the Indian.[1] Of sand used in making mortar, he afterwards distinguishes three sorts; fossil, river, and sea-sand (fossitia, fluviatilis, and marina.[2]) And in relation to the former he has a brief geological remark, which seems borrowed from Vitruvius; who says that fossil sand is not wanting in the parts of Italy which lie west of the Apennine mountains: but that beyond them, towards the Adriatic sea, there is none found; and that in Achaia, in Asia, and in fine throughout the countries beyond sea, it is not even named. This assertion, however, Philander, Scamozzi, and other commentators on Vitruvius, say is incorrect.[3]

OF SALINE SUBSTANCES MENTIONED BY THE ANCIENTS.

Notwithstanding Beckmann's learned and labored argument to prove the ancients unacquainted

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[1] Plin. 36, 9.
[2] Plin. 36, 54.
[3] Vitruv. 2, 6, and annotations thereon.

with our alum; and that the salt called by them alumen, was a native sulphate of iron,[1] there are some who still think that the manufacture of alum must have been known at a much earlier period than he assigns for its first introduction;[2] or else that it was found native in Egypt, Melos, Lipari, and elsewhere, in sufficient quantity for the purposes to which it was anciently applied.

We know that the ancients, without much discrimination, often called by the same name substances widely different in their nature; but which in certain points bore some resemblance to each other; and it is probable the στυπτηρία of the Greeks, called alumen by the Romans, may in some instances have been sulphate of iron; or other vitriolic salt besides what we call alum; but that this too, or a salt very nearly resembling it, was sometimes meant, seems certain.

Some of the properties ascribed to alumen belong to our alum; but not in the least to sulphate of iron. Thus Dioscorides says[3] of the fibrous variety, which he terms σχιστή, that it is exceeding white, (λευκὴ ἄγαν·) and from Pliny's description of this kind[4] we may infer that it was such an efflorescence as that called plume, or fibrous alum; found in considerable quantity on the soil at Solfatara, near Naples; and at La Tolfa, in alum

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[1] Beck. Hist. of Inv. 1, 288.

[2] See Parke's Chem. Essays, v. 1, p. 625.

[3] Dioscor. 5, 123.

[4] Plin. 35, 52.

stone.[1] Pliny, too, speaks of alum as white; as used for whitening wool; as being prepared for certain medicinal uses by burning it in pans until it cease to flow liquid. All which is quite inapplicable to sulphate of iron.[2] The modern alum of commerce generally contains more or less sulphate of iron;[3] and the alumen of the ancients, whether native, or prepared according to their unskilful methods, may have contained so much of the same impurity, occasionally, as to blacken when mixed with the juice of the pomegranate, or with galls.[4] Besides, they may have confounded with alumen, what by some of the earlier mineralogists of modern times was called hair-salt, and supposed to be a variety of alum; but which analysis has shown to be a mixture of the sulphates of magnesia and iron.[5]

As this is called by Kirwan hair-salt,[6] so Dioscorides applies to a certain variety of στυπτηρία a corresponding name, τριχίτις.[7] Of the many varieties which he says there were, he has specified three as used in medicine; the fibrous, or separable (σχιστὴ,) the round (στρογγύλη,) and the moist (ὑγρά.) The σχιστὴ may be rightly denominated *fibrous*, since he says it greatly resembled a certain stone, which might be distinguished from it,

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[1] Cleav. Min. p. 227.
[2] Vide Mill. in Celsum, lib. 4, c. 18.
[3] Cleav. Min. p. 229.
[4] Plin. 35, 52.
[5] Cleav. Min. p. 227.
[6] Kirwan's Min. 2, 13.
[7] Dioscor. 5, 123.

however, as possessing no astringent taste; and this stone we afterwards discover was amianthus.[1] This comparison, altogether unsuitable if we suppose στυπτηρία σχιστή to be sulphate of iron, is perfectly just as applied to what has been in modern times called fibrous alum; which is "composed of capillary crystals, or fibres—white, silky, parallel to each other,"[2] while "the fibres of amianthus are usually straight, almost always parallel, have in most cases a silky lustre, and their color white."[3]

In the island Milo are found, mingled with fibrous gypsum in volcanic rocks, fine specimens of what till lately was thought fibrous alum;[4] but which appears upon analysis to be a sulphate of alumine, containing accidental portions of potash, soda-alum, sulphates of magnesia, iron, and copper.[5] This island is mentioned very particularly by Dioscorides as a locality of στυπτηρία; and Pliny observes that the best alumen of a certain kind was that called Melinum from the island Melos;[6] having before said of the substance generally, that after the Egyptian, the most approved was found in Melos. There can be little doubt, therefore, that the alumen of the ancients comprehended at

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[1] Dioscor. 5, 156.
[2] Cleav. Min. p. 227.
[3] Cleav. Min. p. 405.
[4] Cleav. Min. p. 227.
[5] See Amer. Jour. of Science and Art, No. 46, p. 388.—Klaproth, however, found the requisite proportion of potash in the alum of the Grotta di Alume at Cape Miseno, near Naples; "where nature alone, he says, unassisted by art, is constantly producing perfect alum." (Min. 1, 266.)
[6] Plin. 35, 52.

least this sulphate of alumine; or rather that this is the substance generally meant by the words στυπτηρία, and alumen. For the islands of Lipari and Milo, where the sulphate of alumine is still produced in considerable abundance, were in the times of Diodorus Siculus and Pliny the chief sources of alumen.

The alum mines of Milo; one of which Tournefort examined; would appear from his description[1] to have been capable of furnishing no inconsiderable quantity; but when Diodorus wrote, it seems the supply from this quarter, whatever it may have been, was of small account in comparison with that derived from Lipari; which island, he remarks, contained the celebrated mines of alum, (στυπτηρίας,) whence the Lipareans and the Romans drew large revenues; for enjoying a monopoly of a substance much used, and no where else produced, except in small quantity in Melos only, and raising the price at pleasure, their profits were to an amount incredible.[2] Of Egypt, mentioned by Pliny as a locality of alumen, Diodorus takes no notice; but Herodotus relates that Amasis sent to the people of Delphi, as his contribution towards the building of their temple, a thousand talents of this mineral.[3]

The kind which Dioscorides and Pliny call στρογγύλη, or round, may have been such concre-

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[1] Letter 4th, vol. 1, p. 128, 129, of Eng. trans.
[2] Diod. Sic. 5, 10.
[3] Herod. 2, 180.

tions, or small fibrous masses of native alum as are occasionally found; or rather, perhaps, aluminite, or sub sulphate of alumine, which occurs in roundish or reniform masses; and, possessing some properties in common with alum, would like hair-salt have been readily confounded with it. Some of the characters of that called ὑγρὰ, or moist, by Dioscorides, agree well enough with those of stone or mountain-butter, as Kirwan, Werner, Jameson, and others, term a certain variety of native alum. If we must with Pliny[1] call it liquid; it may have been a strong solution of the native salt, found occasionally in cavities formed in aluminous slate; or in clays embracing the sulphuret of iron.

By *chalcitis*, "a stone from which copper was melted,"[2] Pliny no doubt means pyritous copper; but the relation this bears to sulphuret of iron (such that it is sometimes hard to draw a line between the two)[3] caused them to be confounded, and consequently the sulphate of iron procured from, and found associated with either of these minerals, was called χαλκάνθου, chalcanthum, flos aeris, copperas. And as the two ores were easily confounded, we need not wonder at a like confusion as regards the two sulphates that are derived from them. And again, since the sulphate was sometimes found associated with the sulphuret of

[1] H. N. 35, 52.
[2] Plin. 34, 29.
[3] Cleav. Min. p. 558.

iron; and that was not distinguished from pyritous copper; we find the characters and properties of all the three confounded in one and the same description. Thus Pliny describes[1] chalcitis as a stone from which copper is extracted; meaning pyritous copper; as soft, friable, and like a downy concretion; a description applicable to the sulphuret of iron, as it occurs at times in efflorescences, or stalactitical concretions, or in crusts composed of fibres. The three kinds into which he says chalcitis is distinguished, viz. brass, and misy, and sory, are again, either pyritous copper, or the sulphuret of iron, and the sulphate of iron in two different states. When he says it has veins of brass, and is most approved when of the color of honey, and with delicate branching veins, friable, not stony, he seems to describe that sulphuret of iron which occurs in membranes, or dendritic branches, embraced between layers of other minerals.

The styptic and caustic properties which Dioscorides assigns to chalcitis, belonged, of course, to the vitriolic salts derived from it.[2] The sulphate of iron becomes from exposure yellow, and at last brown; and in these states, probably, answers to the misy and sory of Dioscorides and Pliny.[3] Some of the characters which they ascribe to these substances might, indeed, lead to a belief that they

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[1] H. N. 34, 29. [2] Dioscor. 5, 115.
[3] Kidd's Min. 2, 22.—Jam. Min. 2, 343.

were varieties of pyrites; but this may be explained from the confusion just alluded to. That misy was what has been called Roman vitriol, or yellow copperas, seems unquestionable;[1] and it is expressly so named by Democritus,[2] who says that sory (σόρυ) is always found in misy, (μίσυ,) and that this latter is called yellow copperas (χλωρὸς χαλκάνθος).

Of the *melanteria*, or ink stone, Dioscorides remarks that "some have taken it to be the same with sory, from which it is distinct, though not unlike."[3] It was probably a sulphate of iron formed in a matrix containing vegetable astringent matter; by union with which was produced a natural ink.

Chalcanthum, which appears to have been so named for the reasons above stated, rather than, as some suppose, because of the brass yellow color of the mineral from which it was obtained, was otherwise called atramentum sutorium, from its being used to blacken leather.

Pliny, describing a process by which it was made, says that upon cords suspended in the vats containing water impregnated with it, there accumulated vitreous clusters of a remarkable lustre, and adds, "vitrumque esse creditur."[4] Hence are derived our terms vitriol, and vitriolic.

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[1] See Hardouin on Pliny, v. 9, p. 320.
[2] As cited by Saumaise—Exercit. Plin. p. 815, a AB.
[3] Dioscor. 5, 119. [4] Plin. 34, 32.

That the ἅλς ἀμμωνιακὸς, sal ammoniac of Dioscorides, Celsus, and Pliny,[1] was not our sal ammoniac, the muriate of ammonia; but rock salt; seems to have been sufficiently proved by Beckmann;[2] but his learned examination of this subject has not rendered it equally certain that the ancients were unacquainted with the muriate of ammonia. The rock salt designated as ammoniac was brought through Egypt, from as far, says Pliny, as the oracle of Hammon; where Arrian states that it was dug, a native fossil salt (ἅλες αὐτομάτοι ὀρυκτοί);[3] and when afterwards the muriate of ammonia came to be manufactured in Egypt, this received the same name. It has been thought, however, by some modern mineralogists, that the ancients knew muriate of ammonia under the name of nitrum;[4] and, although Beckmann maintains the opposite opinion, the grounds on which he rests his argument do not always bear him out. He observes that "there are two properties with which the ancients might have accidentally become acquainted, and which in that case would have been sufficient to make known or define to us this salt (the muriate of ammonia). In the first place, by an accidental mixture of quick lime, the strong smell or unpleasant vapor diffused by the volatile alkali separated

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1 See Dioscor. 5, 126.—Cels. 66.—Plin. 31, 39.

2 Hist. of Inv. 4, 360, seqq. 3 De Exped. Alex. l. 3, c. 4.

4 See before, p. 16.

from the acid might have been observed." Now what Beckmann seems willing to admit as a criterion of sal ammoniac is mentioned by Pliny of nitrum; which, he says, sprinkled with lime, gives forth a powerful odor" (calce aspersum reddit odorem vehementem[1]).

Beckmann appears to doubt what he says "several writers have asserted, that sal ammoniac comes also from the East Indies."[2] But it certainly is brought thence at this day; and may have been manufactured there, and have found its way thence to Europe in the time of Pliny also; for we find that unchangeable country producing the same things then as now; indigo, indian ink, fine steel, sugar, silks, &c.[3]—since "in India all artificial productions are of very great antiquity."[4] The manufacture of sal ammoniac in Egypt also may, for aught we know, have been more ancient than is thought. We are not justified in concluding that the ancients were ignorant of every thing of which we discover no mention in their works. Beckmann, on no other ground, rejects the sense put upon the words "usus ad fenestras," by Lehmann, (who supposes Pliny here to speak of window frames, to which a certain pigment was applied), and asserts that "glass windows were at that time unknown."[5] But now we

[1] Plin. 31, 46, 4.
[2] Hist. of Inv. 4, 381.
[3] See before, pp. 43, 67.—Plin. 12, 17,—35, 25,—34, 41.—Virg. Georg. 2, 121.
[4] Beck. Hist. of Inv. 4, 118.
[5] Ibid. 2, 237.

find in Pompeii glass windows,[1] which we are very sure date as far back as Pliny's time; since he witnessed the catastrophe that buried them. One of the chief reasons for supposing the ancients to have been ignorant of our sal ammoniac and nitre is, that we know of very few uses to which they might have been applied. But though they may have had little inducement to manufacture them, even had they possessed the art, yet they could hardly have failed to observe them in a native state; since both these salts are found occurring thus in southern Italy and elsewhere.[2] Beckmann observes that the ancients were so much inclined to look for medicinal virtue in all natural bodies, there is reason to think they soon collected and made trial of the nitrous efflorescence sometimes found on walls.[3] Is it probable, then, they would neglect the purer nitre found in such caves as that at Molfetta in the kingdom of Naples? Where, as appears from Klaproth's account of it, nitre is produced in great quantity;[4] as sal ammoniac is at Solfatara.[5] These two salts, therefore, the muriate of ammonia, and the nitrate of potash, may be included among the varieties of nitrum spoken of by Pliny; although the greater part of them, no doubt, contained in some shape

[1] Libr. of Entert. Know., Pompeii, 1, 155.
[2] Cleav. Min. pp. 122—124, 125. [3] Hist. of Inv. 4, 529.
[4] Klapr. Min. 1, 270.—Cleav. Min. p. 124.
[5] Brongn. Tr. Elem. de Min. 1, 110.

tive sulphur, which the Greeks termed ἄπυρον.[1] That which had been freed from impurities by an artificial process; which had passed the fire; was called πεπυρώμενον, and distinguished into various kinds, appropriated to various uses, according, probably, to their several degrees of purity. Thus one kind was used for fumigating woollens, to render them more white and soft; another for making matches; purposes to which sulphur yet continues to be applied. The use of it in expiation and lustration, which was very common, we find referred to by many ancient authors.[2]

Ἄσφαλτος, Bitumen, in various states, from that of fluid transparent naphtha, to that of dry, solid, black asphaltum, was well known, and much used among the ancients. Semiramis, we are told, employed it as a cement in building the walls of Babylon;[3] for which purpose it was obtained from the river Is, which discharged itself into the Euphrates about eight days journey from Babylon.[4] But it was also found near that city, in great abundance, and in a liquid form;[5] while elsewhere, as in Syria, asphaltum was dug from quarries in a solid state.[6] Its medicinal virtues may be found

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[1] Dioscor. 5, 124.—Plin. 35, 50.

[2] See Hom. Od. χ. 481.—Theocr. Id. 24, v. 94.—Ovid. A. A. lib. 2, v. 330.—Juven. Sat. 2, v. 157.

[3] Diod. Sic. 2, 7.—Vitruv. 8, 3, 8. [4] Herod. 1, 179.

[5] Strab. p. 743.—Plutarch. v. 1, p. 685, D.—Diod. Sic. 2, 12.—Justin. 1, 2.—Quint. Curt. 5, 1.—But see, for a learned examination of this subject, Parkinson's Organ. Rem. v. 1, p. 131.

[6] Vitruv. 8, 3, 8.

detailed by Dioscorides,[1] and by Pliny;[2] who also specify various economical uses to which it was applied. At Agrigentum, they inform us, it was burnt in lamps as a substitute for oil; and called, in fact, Sicilian oil; but erroneously, as Dioscorides observes, it being a species of liquid bitumen (ἀσφάλτου ὑγρᾶς εἶδος).

A yellowish naphtha, found near Amiano in the Dutchy of Parma, has been, in like manner, used to light the streets of Genoa; and in Persia also a like substance is burnt in place of oil in lamps. A variety less fluid and transparent, called petroleum, is applied to the same use in different parts of the United States; as near Scottsville in Kentucky, where it was collected from the surface of a spring of water in sufficient quantity to be sold at twenty-five cents a gallon.[3]

From experiments made on mummies it has been inferred that the Egyptians used asphaltum in the embalming of their dead.[4]

The exceeding inflammable nature of naphtha, and even of its vapor, caused it to be employed by ancient jugglers in their deceptions with fire; and Plutarch[5] and Pliny[6] explain the story of the bridal dress and crown, which Medea presented to Creusa, by supposing them to have been anointed with

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[1] Lib. 1, cc. 99, 100, 101. [2] H. N. 35, 51.
[3] Cleav. Min. p. 486.—See also Haüy, Min. 3, 224.
[4] Jam. Min. 2, 364.—Haüy, Min. 3, 324.
[5] Vol. 1, p. 686, A. [6] H. N. 2, 109.

naphtha, which, as soon as the princess approached the burning altar, burst out into flame.

The principal ingredient in the celebrated Grecian fire is supposed by Klaproth to have been some variety of asphaltum.

Amber was well known to the ancients many centuries before the age of Pliny, and various ornamental articles were made of it; but, in his time, only for the use of women.[1] According to the common fable, it consisted of the tears of those poplars into which Phaeton's sisters were transformed;[2] but Pliny has collected a great variety of opinions of different authors as to its origin, its nature, and the derivation of its name, each one more extravagant than that which had preceded. His own belief, not differing much from the now received, is that it consists of the resinous juice of certain trees, which had in course of time become mineralized in the earth. Hence was its Latin name, succinum, derived, "quod arboris succum prisci nostri credidere."[3] Its Greek name, ἤλεκτρον, was from its resemblance in color to the alloy of gold and silver, so called; or from a name of the sun, Ηλέκτωρ. The women of Syria, who ornamented their spindles with it, called it ἄρπαξ, because of its attracting leaves, chaff, and the fringes of their garments. Pliny says the different colors it exhibited in its native state were sometimes pro-

[1] Plin. 37, 11.
[2] See Dion. Perieg. vv. 289, 316.
[3] Plin. 37, 11.

duced by artificial means; since they could dye it of whatever tint they pleased; wherefore it was much used in counterfeiting translucent gems, and especially the amethyst. Demostratus[1] called amber, lyncurion; supposing it produced from the urine of the lynx; from that of males when of a deeper and more fiery tint; but when feebler and paler, of the other sex. Other writers spoke of lyncurion as a substance distinct from amber, but having the origin indicated by its name. As Pliny, however, doubts[2] the existence of any such substance, we might, perhaps, spare ourselves the trouble of considering what may have been the mineral to which so strange an origin has been assigned. From what Theophrastus says of it,[3] taken in connexion with the remarks of Pliny, it seems highly probable that some variety of amber had been distinguished by the name, λυγκούριον. Theophrastus, it is true, compares lyncurion with amber, as if it were something different, though like; but they may notwithstanding have been one and the same thing. For he evidently speaks on the report of others; introducing his mention of it with the phrase "they say" (οἱ δὲ φάσι); from which we must infer that he was not acquainted with the mineral himself. It was engraved, he says, for seals; and that alone may have led him

[1] As cited by Pliny, H. N. 37, 11. [2] H. N. 37, 13.
[3] De Lapid. c. 50.

to ascribe to it the property of hardness; which would seem inconsistent with its being amber. He observes that like amber it attracts, not only chaff and wood, but, as Diocles asserts, even light particles of brass and iron. It has been thought belemnite by some; tourmaline by others; and by others again, the hyacinth.[1]

That distinction of sex, according to which Theophrastus, Pliny, and other ancients, termed varieties of the same mineral male or female, as their color was more or less intense, or as they possessed in greater or less degree some other distinguishing property, is rather a fanciful one when applied to the sard, the cyanus, and others;[2] but as regards the lyncurion, seems to have very naturally originated from the difference of sex in the animals supposed to have produced its different varieties.

There can be little doubt that the Gagates of Dioscorides[3] and Pliny[4] is the modern jet; which, with some mineralogists, still retains its ancient name—a name derived from the river Gagas in Lycia, about whose mouth this mineral was found.

The Thracian stone, which Nicander[5] directs to be burnt together with gagates, sulphur, bitumen, and other substances, which during their combus-

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[1] Beck. Hist. of Inv. v. 1, pp. 141, 142.
[2] Theoph. c. 56.—Miner. des Gens du Monde, p. 248.
[3] L. 5, c. 146. [4] H. N. 36, 34.
[5] Theriac. v. 45.

tion give forth a powerful scent; in order to drive away serpents; was brought, as that author and Dioscorides[1] inform us, from the Thracian river Pontus. Dioscorides ascribes the same virtues to it as to the gagates; and he and Pliny[2] observe of it, as Nicander does, that its flame is brightened by water, but extinguished by oil,[3] though the two first named omit to add—when it is burning feebly—a condition which may be inferred from Nicander's words, "τυτθὸν ὅτ' ὀδμήσηται." This property of being kindled by water and extinguished by oil; assigned by Dioscorides to asphaltum also, and by Pliny to gagates, might with about equal truth be ascribed to our bituminous coal; with which some naturalists have been disposed to identify this Thracian stone;[4] and, from the manner in which Aristotle speaks of it,[5] they seem to have good reason for so doing.

Theophrastus, speaking of combustible minerals, says that "some of the more frangible are broken into coals,[6] and are more durable; as those in a mine near Bina, and those which the river brings down. For they take fire when coals are

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[1] L. 5, c. 147. [2] H. N. 33, 30.

[3] Theriac. v. 46.

Ἡ θ' ὕδατι βρεχθεῖσα σελάσσεται, ἔσβεσε δ' αὐτὴν
Τυτθὸν ὅτ' ὀδμήσηται ἐπιῤῥανθέντος ἐλαίου.

[4] See Hill's Theophrastus, Notes, p. 55.

[5] De Mirab. Auscult. v. 1, p. 1162.

[6] Or, according to the conjecture of Saumaise, (who for θραύσει would read καύσει,) "become coals in burning."

placed upon them; and burn as long as one continues to blow them: and after they expire, may again be kindled; so that they can be used for a long time; but their odor is very strong and disagreeable."[1] What place and river Theophrastus here speaks of is not known. Hill, upon what authority he does not say, finds them in Thrace; and supposes the mineral to be the same with the Thracian stone just now mentioned.[2]

Another stone which occurred in quantity at the promontory called Erineas, "like that at Bina, emitted when burnt the odor of bitumen, and the result of the combustion resembled calcined earth."[3]

If these minerals were neither of them bituminous coal, there can be little doubt, however, entertained respecting that which follows; as to which Theophrastus says that "of frangible minerals, those called simply coals because of the use they serve, are earthy; but are kindled and burnt like coals. They occur in Liguria, as does amber also, and in Elis as you go to Olympia by the mountain road. Of these, smiths make use."[4]

That mineral coal was known, and even used in the time of Theophrastus, these passages seem to afford sufficient proof. That it was so little used and spoken of among the ancients may be accounted for in various ways. The want of so simple a contrivance as a grate may have pre-

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[1] Theoph. c. 23.
[2] Hill's Theoph.—Notes, p. 54.
[3] Theoph. c. 27.
[4] Theoph. c. 28.

vented its ordinary use as fuel; or it may have been neglected from the greater abundance of other fuel at a period of the world when so much larger a portion of Europe was still clothed in forest. Besides that in the then state of society, and of the industrious arts, and under the benignant climate of a great part of Greece, there was less occasion for fuel of any kind.

Spinus, which Theophrastus classes with combustible minerals, and of which he says that "being taken from the mine, it was cut up, and put together in the sun, when it took fire spontaneously; and especially if moistened previously,"[1] was either pyrites, or (which is more probable) an aluminous shale like that near Weymouth, or at Lyme in Dorsetshire.[2] Aristotle speaks of this stone called spinus (σπῖνος) in like manner, but somewhat less clearly than Theophrastus does.[3] We learn from him, however, that it was a Thracian mineral; and that, perhaps, has caused it to be by some confounded with the Thracian stone. Saumaise supposes this spinus to be mineral coal.[4]

In the case of some substances, a difference of manners and customs between ancient and modern times, or the discovery of new properties in the minerals themselves, has caused them to be used

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[1] Theoph. c. 24. [2] See Bakewell's Geology, c. 12th, p. 195.
[3] Arist. de Mirab. Auscult. v. 1, p. 1153.
Exercit. Plin. p. 179, b. D.

and esteemed very differently by the ancients and by us. As examples may be named asbestus and the magnet. The former is a substance full as well known to us as to the ancients; but by them, in consequence of their burning the bodies of their dead, and of the religious care with which they guarded against the extinction of their sacred fire, it was applied to peculiar uses.

It probably derived its name, ἀσβέστος, that is, *unextinguished*, from its being used to form wicks for the lamps which maintained perpetual fire in many ancient temples. Such lamps Strabo and Plutarch style ἀσβέστα, unextinguished, or perpetual;[1] and Pausanias speaks of a golden lamp of this kind, made by Callimachus, an Athenian artist, for Minerva, which, "though it was kept ever burning, as well by day as night, was only once a year supplied with oil, and had a wick made of Carpasian linen, the only linen which is not consumed by fire."[2] This linen, called Carpasian from Carpasia, a town of Cyprus, was of the same kind with that described by Strabo as made of the Carystian stone, an asbestus found at Carystus in Eubœa.[3] Napkins of which, he says, were, when soiled, thrown into the fire, and cleansed as others are by washing. And it was in consequence of this that the variety of asbestus

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[1] See Strab. p. 396.—Plut. de Def. Orac. v. 2, p. 410, B.—411 C.
[2] Paus. lib. 1, c. 26.
[3] Strab. p. 446.—Brongn. Tr. Elem. de Min. 1, 482.

suited for such use was called ἀμίαντος, amianthus, *pure, undefiled;* because, being indestructible in any ordinary fire, it was restored to its original purity and whiteness simply by casting it into the flames.[1] Where amianthus occurs, as it does in many countries, with fibres sufficiently long and flexible for that purpose, it is often now, as anciently it was, spun and woven into cloth; and has in modern times been successfully manufactured into paper, gloves, purses, ribbands, girdles, and various other things. The natives of Greenland even use it for the wicks of lamps,[2] as we have just now seen the ancients did.

There is no sufficient reason for the doubts which some have entertained, that the asbestine linen, or linum vivum spoken of by Pliny, was of this same material; table napkins of which that author says he had seen, at an entertainment, blazing in the fire; and, whatever soiled them being thus burned out, rendered brighter than they could have been by water.[3] The funeral dress of kings, he adds, being made of this material, preserved their remains distinct from the ashes of the pyre. But he speaks of it as a rare and costly cloth, the material being difficult to weave by reason of the shortness of the fibre. It is true that Pliny adds some fables respecting this linen, but

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[1] Dioscor. 5, 158.
[2] See Jam. 1, 530.
[3] Plin. 19, 1.

it is not unusual with him thus to jumble truth and falsehood.

Of amianthus he has elsewhere observed, that it resembles alumen, and remains uninjured in the fire (alumini similis nihil igni deperdit);[1] copying, no doubt, Dioscorides;[2] but omitting the epithet fibrous (σχιστή), which his original has added to alumen; and in which only we may suppose the resemblance to have lain. Theophrastus characterizes amianthus better by comparing it to rotten wood.[3]

With respect to the magnet, its peculiar property was well known to the ancients many centuries before the Christian era; and is alluded to by Hippocrates, but merely to designate the stone, which he prescribes as remediate in a certain case.[4] For it was as a remedy only, or as a charm, that the ancients used the magnet, unless we would call an use of it that strange attempt of Dinocharres to construct for Ptolemy Philadelphus the vaulted roof of a temple beneath which the statue of his queen Arsinoe should be held suspended in the air.[5]

It has been asserted that the ancients, as far back as Aristotle, possessed some imperfect notion

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[1] Plin. 36, 31. [2] Dioscor. 5, 156.

[3] De lapid. c. 29.

[4] Hippocr. Op. p. 686, l. 46.—He describes it as the stone which forcibly draws iron (λίθον ἥτις τὸν σίδηρον ἁρπάζει).

[5] Plin. 34, 42.

of the polarity of the magnet, and Majolus cites a lost work of that philosopher to prove him acquainted with this property.[1] If the fact were so, we might easily discern the origin of those other notions; of a stone called Theamedes,[2] which repelled instead of attracting iron; and of two mountains near the river Indus, one of which attracted, and the other repelled that metal.[3] But as there is very little ground for ascribing this knowledge to the ancients, so there is still less reason to believe what some authors have ventured to assert, that the Egyptians, Phœnicians, and Carthaginians made use of the magnetic needle in their navigation.[4]

As one and the same mineral sometimes received among the ancients different names, according as it was procured by different methods, from different places, or from substances apparently unlike; so, on the other hand, things of dissimilar nature were called by the same name, merely because of some accidental agreement in color, place of origin, or use to which they were applied. Thus the name magnet was given not only to what we call the native magnet, magnetic oxide of iron; but to a substance wholly different, and

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[1] As to this supposed work of Aristotle, De Lapidibus, see, besides Majoli Dies Canic. p. 566—Azuni Dissertation sur l'origine de la Boussole, p. 34.

[2] Plin. 36, 25.—Beck. Hist. of Inv. 1, 143.

[3] Plin. 2, 98.

[4] See this question examined in the Dissertation of Azuni just now cited.

which appears to have been some variety of steatite. It is highly probable that these two minerals, so different in character, were both denominated the magnetic stone, from their being both found in a country called Magnesia; for of the five localities specified by Pliny, whence as many varieties of magnet were obtained, one is Magnesia in Thessaly, and another a city of Asia, bearing the same name. And it was here, he says, a magnet was found, of a whitish color, somewhat resembling pumice, and not attracting iron.[1] Which taken in connexion with what Theophrastus says of the magnet, that it was suited for turning in the lathe and of a silvery appearance,[2] lead to the inference that this magnet was talc or steatite: a certain variety of which, as it well resists the fire, and is otherwise fitted for such purpose, was employed anciently for forming culinary vessels; as it still continues to be in certain countries where it occurs in sufficient quantity, and of the proper kind.[3] This mineral contains in large proportion the earth called magnesia; a name, of which we may thus trace the origin. Though, perhaps, a much purer form than this steatite affords, of the earth now called magnesia, may have been sometimes designated as the magnesian stone. For when Hippocrates prescribes[4] the use of it (τῆς μαγνησίης λίθου) as a cathartic, it seems highly pro-

[1] Plin. 36, 25.
[2] Theoph. c. 73.
[3] Cleav. Min. p. 442.
[4] Page 543, l. 27.

bable that he meant the native carbonate of magnesia, which is found in an earthy, as well as in every intermediate state, between that and the most compact. He certainly does not intend the magnet; as well because it is not purgative, as because he elsewhere[1] describes that differently, as the stone, which draws iron, and would have named it, not the Magnesian, but the Heraclean stone.

The story of the discovery of the magnet by one Magnes, a shepherd, on mount Ida; who found his hob-nailed shoes, and iron-pointed staff, cling to the rock upon which he trod, seems to be a poetical fiction, derived by Pliny from Nicander.

The better derivation just before suggested, is the one which Lucretius has adopted for the magnes,

> Quem magneta vocant patrio de nomine Graii,
> Magnetum, quia sit patriis in montibus ortus.[2]

Indeed, it appears that in the case of this mineral, as of nitre already mentioned, the ancient name, formerly applied to distinct substances, has been retained by us in connexion with that one to which it was least appropriate. For the name magnet or magnetic stone, belonged properly to the *Magnesian* mineral, just now spoken of; while the mineral by *us* called magnet, was by the ancients more appropriately called the Heraclean

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[1] See before p. 113.

[2] Lucr. De Nat. Rerum. 6. 808.

stone, from Heraclea, a city of Lydia.[1] The name Magnetic stone, (μαγνῆτις λίθος) was given to it, as to some other minerals, simply because they occurred in Magnesia; and was extended afterwards to certain substances that bore resemblance to these Magnesian minerals, without regard to their localities. Thus the magnes lapis spoken of by Pliny[2] as used in making glass, was probably manganese, which had received that name from its resemblance to magnetic iron ore; for which it was mistaken, not only by Agricola and Kircher, but even at a later period.[3]

As the loadstone was sometimes confounded, in name at least, with steatite, because, like that brought from Magnesia; so was it, from its being found in Lydia, confounded[4] also with another wholly different Lydian mineral, the basanite, or touchstone, designated as the Lydian stone, (lapis Lydius,) because the best were obtained from the channel of the Tmolus, a Lydian stream. These Lydian stones were rolled pieces of siliceous slate, which Theophrastus describes as resembling a smooth flat pebble, about twice as big as the largest counter, (ψῆφος).[5] According to Pliny they were of moderate size, not exceeding four inches

[1] See Hesych. ἡρακλεία λίθος.—Plato speaks of the wondrous phenomena exhibited in the attraction of amber and the Heraclean stones, (τὰ θαυμαζόμενα ἠλέκτρων περὶ τῆς ἕλξεως καὶ τῶν ἡρακλείων λίθων.) In Timæo v. 7. p. 88. edit. Tauch.

[2] H. N. 36, 66.

[3] Beck. H. of Inv. 4, 59.

[4] Plin. 33, 43.

[5] De Lapid. c. 80.

in length by two in breadth. Pliny calls this stone coticula, but observes that by some it is called the Heraclean and by others the Lydian stone.[1] In his time it was found in various other places, besides the bed of the Tmolus. From what he and Theophrastus say about the mode of using it, we may infer that the ancients were capable of detecting, not only a slight degree of base alloy; but even when copper and silver contained a small portion of gold, (χαλκὸν κατάχρυσον καὶ ἄργυρον.) Pliny says they could determine how much of gold, how much of silver, or of copper might be in the mass, to the smallest difference, with surprising and unfailing art. The Greeks though, especially, appear, not only from what Theophrastus says, but from their frequent employment of metaphorical language derived from its use, and the many allusions to it by their writers, to have been familiarly acquainted with this mineral.[2]

But distinct things were comprehended under one name, not only because they agreed in some striking property, or as to their place of origin; but in some cases because they were applied to like uses. Thus we find that white clay or chalk, quick-lime, and the sulphate of lime were all of them occasionally called gypsum; a name, which is now appropriated to the last. The term signi-

[1] H. N. 33, 43.

[2] See Theog. v. 449. Pind. Pyth. 10, 105. Bacchyl. Anal. Brunck. 1, 149. Soph. Œd. Tyr. v. 492. Eurip. Med. v. 516. Theocr. Id. 2. v. 36. Plat. Gorg. c. 33. Clem. Alex. Strom. lib. 1. p. 291. D.

fying an *earth that has been subjected to the action of fire*,[1] was very properly applied to the last two substances, and may have been extended to clay or chalk likewise; because that also might be used, as the others sometimes were, to whiten surfaces.

That such want of discrimination may not be imputed to gross ignorance, let us bear in mind, that we are ourselves often chargeable with like inaccuracy; when, for example, we speak of crayons of black chalk, of red-lead and black-lead pencils; calling thus certain substances by the name of others to which they bear no relation, except in so far as they are applied to like use; and again, when we name differently, chalk, whitening, Paris white and Vienna white; all one and the same substance, though prepared for use in different ways, or procured from different places.

Though the name gypsum was applied, as has been said, to different things, yet it more commonly signified the sulphate of lime, which is still so called. Theophrastus and Pliny seem to have been well acquainted with the mode of preparing it, and with certain of its properties and uses; but as the latter is aware of some connexion between lime and gypsum,[2] so the former sometimes uses the term γύψος in the more general sense just now

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[1] Γύψος, οἱονεὶ γηίψος τις οὖσα, ἡ ἐψηθεῖσα γῆ. Etym. Mag. p. 222.

[2] He observes (36. 59.) "cognata calci res gypsum est."

assigned to it, of *an earth prepared by fire;* and evidently confounds it with quick-lime, when he says that its heat upon being moistened is surprising, and that when used in building they break it up, and pouring water upon it, stir it about with sticks, since its heat is such that they cannot with the hand.[1] The circumstance too, he mentions, of a ship laden with cloth and gypsum, which in consequence of the water having reached the cargo, took fire and was burnt;[2] is to be explained by supposing what is called gypsum on this occasion to have been lime. He distinguishes between the earthy gypsum and that prepared by burning certain stones; the former being used chiefly as a substitute for Cimolian earth, in cleansing woolen garments.[3] This earthy gypsum, called Tymphaic from Tymphaia in Ætolia,[4] was probably such as is still found in certain places forming "beds of considerable thickness resting on other varieties of gypsum."[5] Theophrastus mentions the superior fitness of gypsum for taking impressions;[6] and it was, not long before his time, first employed for taking moulds from the human face, by Lysistratus, a brother of the famous statuary Lysippus, whom Alexander distinguished by his favor.[7]

The use of gypsum as stucco in cornices, ap-

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[1] Theoph. c. 112.
[2] Theoph. c. 118.
[3] Theoph. c. 110. Plin. 35, 57.
[4] Plin. 4. 3.
[5] Cleav. Min. p. 208.
[6] Theoph. c. 116.
[7] Plin. 35. 44.

proved by Pliny,[1] is expressly forbidden by higher authority in matters of this kind, that of Vitruvius, who says "hisque (coronis) minime gypsum debet admisceri."[2] Gypsum was used moreover to clarify wine, and preserve it from acidity; to coat vessels so as to close entirely their joints; and to pack up, and preserve grapes in jars.[3]

The doubts which have been entertained, whether the gypsum of the ancients was the same with ours, were occasioned probably by the confusion above noticed; but there can be no difference of opinion as to that gypsum, which Pliny says was ascertained to be the best; made of the lapis specularis, or what had a like foliated structure, (squamamve talem habente,) which was evidently selenite.[4] He adds that gypsum, when moistened, must be used immediately, for that it very soon hardens and becomes dry, "celerime coit ac siccatur."

Lapis specularis, in Pliny and other ancient authors, commonly signifies mica; but as selenite was applied to similar uses, we sometimes, as in the passage just referred to, find that to be the substance meant. The mica called lapis specularis from its use in windows, was furnished originally by Spain only; but in Pliny's time was found

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[1] H. N. 36, 59. [2] Vitruv. 7. 3. 3.

[3] Geopon. pp. 462, 483, 494.

[4] Exercit. Plin. p. 184, a C.—771 a B. C. D. E.

in Cyprus, Sicily, and elsewhere; though none equal to that of Spain and Cappadocia. The latter sort is spoken of by Strabo as forming large masses, which were exported.[1] Pliny describes it as occurring in Italy embraced in flint (complexu silicis alligati).[2] It must have been found by the ancients of an extraordinary size, if it even approached the limit assigned by Pliny, who observes that it had never yet been obtained above five feet in length.[3]

Although Seneca speaks of the use of this substance, for the purpose of admitting light, in terms from which we might infer that such use was not yet very ancient in his time,[4] it seems, then at least, to have been very commonly applied to the same purposes for which window glass is now employed. Columella speaks of guarding plants against the cold by means of it; and says that in this way the table of Tiberius was supplied with cucumbers almost throughout the year.[5] Palladius directs the window of the oil cellar to be closed with it.[6] Pliny speaks of protecting apple trees with it,[7] and Martial alludes to a like liberal use of it in enclosing both apple trees and vines.[8]

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[1] Strab. p. 540.
[2] H. N. 36, 45.
[3] Ibid.
[4] Epist. 90.
[5] Colum. 11, 3, 52.
[6] Pallad. 1, 20, 1.
[7] H. N. 15, 16.
[8] Mart. Ep. 8, 14—68.

Banqueting rooms,[1] baths,[2] entire porticos,[3] were secured by means of it against the inclemency of the weather, while "the pure sun and unadulterate day" could freely enter.

> Hibernis objecta Notis specularia puros
> Admittunt soles et sine fœce diem.
>
> MART. EP. 8, 14, 2.

One use of mica or of selenite that especially merits notice, is mentioned by Pliny when, speaking of the materials of which bee-hives should be formed, he says many had made them of the specular stone, that they might see the bees at work within.[4] The Siberian mica, or Muscovy glass, is, as the specular stone of Spain and Cappadocia used to be, an article of commerce; and is sometimes seen in plates between three and four feet square. In Siberia, in Peru, and elsewhere, it is used in windows as a substitute for glass; to which it is even preferred in certain cases; as on board ships of war, where it is not liable to be broken by the concussion which follows the discharge of cannon.

The alabaster of the ancients, and one principal use to which it was applied, have been already

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[1] Sen. Natural Quæst. 4, 13.—De Prov. c. 4.

[2] Sen. Ep. 86.

[3] Plin. Epist. 1, 17—4, 21.

[4] H. N. 21, 47.—He elsewhere speaks of Aristomachus, who spent fifty-eight years solely in studying bees; and Philiseus, who, from having passed his life in solitude occupied in the same study, was surnamed Agrius. (H. N. 11, 9.)

spoken of; but it is a substance which deserves some further notice. That it was also denominated onyx[1] will appear less strange if we bear in mind that it was, commonly, stalagmitic carbonate of lime;[2] and composed of parallel undulating layers, often differing in color, so that both it and the siliceous gem called onyx derived that name from a supposed resemblance to the human nail.[3] Pliny observes that the stone onyx, which some called alabastrites, had been thought by their ancestors to occur in Arabia only; but in his time was obtained from the neighborhood of Thebes in Egypt, from Damascus in Syria, and from many other places. He elsewhere[4] speaks of a city, Alabastron, in the Thebais; which probably received its name from the substance quarried there. This Theban alabaster is said to have been yellowish white, inclining to rose-red; like a variety now found at Alicant and Valencia in Spain, and at Trappani in Sicily.[5]

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[1] It is spoken of by Dioscorides (5, 153) as λίθος ἀλαβαστρίτης ὁ καλουμένος ὄνυξ.

[2] The name, however, was extended to stalactitic carbonate of lime, arragonite, and other translucent substances, of about the same degree of hardness.

[3] Plin. 37, 24.—The colors of these parallel layers are often strongly contrasted. In Sicily is found an alabaster varied with bright red and yellow stripes; another with yellow and white stripes. At mount Pellegrino, one of yellow and deep black. (Jam. Min. 2, 173.)

[4] H. N. 5, 11.

[5] Jam. Min. 2, 173.—Respecting the Egyptian alabaster, see Winck. Stor. d. A. del Dis. v. 2, p. 11, and Brongn. Min. 1, 217.

One of the earliest uses to which alabaster was applied was to form drinking cups; afterwards the feet of couches and of chairs were made of it; hollow vessels of very large size, and columns, of which Cornelius Nepos had seen some, thirty-two feet in length; and Pliny saw above thirty in the supper room of Calistus, the freedman of Claudius.[1] Pliny notes its being hollowed to form unguent vessels, a purpose to which it was peculiarly adapted.[2] This use of it seems to have been widely diffused, and ancient. Herodotus speaks of an alabaster of ointment (μύρου ἀλάβαστρον);[3] Cicero of "alabaster plenus unguenti;"[4] and in the New Testament we read of "an alabaster box of very precious ointment."[5] The name of the substance was, in fact, given to vessels made of other materials when applied to that use, so that we find in Theocritus "golden alabasters of Syrian ointment."[6] Propertius, too, by murrheus onyx[7] means an unguent vessel of porcelain; for we shall hereafter see that murrhina or murrhea were porcelain; and onyx, a synonym of alabaster, here indicates merely the purpose to which the vessel was applied. Horace likewise speaks of "nardi parvus onyx;"[8] and Martial more than

[1] Plin. 36, 12.
[2] Plin. 13, 2—36, 12.
[3] L. 3, c. 20.
[4] 2, Acad. apud Nonium. 15, 17.
[5] Matt. xxvi. 7—Mark xiv. 3—Luke vii. 37.
[6] Id. 15, 114.
[7] Prop. 3. 10, 22.
[8] Od. 4, 12, 17.

once uses the word onyx in the same sense.[1] Although the Greeks, therefore, who seldom looked abroad for the original of words they used, may, as modern lexicographers do, have fancied that ἀλάβαστρον was derived from α privative and λαβή a handle, yet it is probable that they derived the name, together with the substance, from Arabia, which was for a long time the only source of it, and in whose language al batstraton signifies the whitish stone.[2]

The *Lygdinus lapis* which was found in Paros, and by many thought little inferior to alabaster for preserving unguents,[3] was the finest grained Parian marble.

The Assian stone,[4] the Phrygian stone,[5] and that kind of schistos, which Pliny says, was called anthracites,[6] were probably aluminous slate containing more or less pyrites. With this supposition, all that is said of these minerals, will be found to agree. The Phrygian stone became red when burnt, and was used in dyeing cloths. It and the Assian stone are mentioned by Dioscorides next before pyrites.[7] The principal use of it, according to him, and from which it derived its name, was by Phrygian dyers. And the Assian stone is characterized by a laminated structure; a saline efflorescence of a sharp taste; and its

[1] Epigr. 6, 42, 14—7, 94, 1.
[2] Harris' Hist. of the Bible.
[3] Plin. 36, 13.
[4] Plin. 36, 27.
[5] Plin. 36, 36.
[6] Plin. 36, 38.
[7] L. 5, c. 141, 142.

styptic properties.[1] This Assian stone, as it is called by Pliny, who derives its name from Assos in the Troad, where it was obtained, is called by Dioscorides and Celsus,[2] the Asian stone, (λίθος Ασίος, Lapis Asius;) the last mentioned author appearing to derive its name from Asia.[3] All three agree in classing it with the stones, which, from their consuming the bodies of the dead enclosed within them, were called sarcophagi.

The *chernites*, which Pliny,[4] after Theophrastus,[5] tells us, was very like ivory; and in a coffin of which the body of Darius lay, was probably gypseus alabaster—and the *porus*, described by those authors as "resembling in color and hardness Parian marble, but peculiarly light, for which reason the Egyptians employed it for cornices in their best constructed buildings," was calcareous tufa.[6]

The stones called πυρομάχοι and μυλίαι by Aristotle[7] and Theophrastus;[8] pyrites and molares by Pliny,[9] were sometimes common compact limestone.[10] The use of πυριμάχος in making iron, mentioned by Aristotle, agrees well with the idea of its being limestone; and Pliny,[11] speaking of

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[1] Respecting the Assian stone, see Mill. in Cels. p. 191; and respecting the Phrygian stone, p. 190.

[2] Dioscor. 5. 141.—Cels. 4. 24.

[3] For he says "ex quo in Asia lapidi Asio gratia est"—(4. 24.)

[4] H. N. 36. 28.

[5] De Lapid. c. 15.

[6] See Strabo, p. 629.

[7] Vol. I., p. 590, 1153.

[8] De Lapid. c. 19.

[9] H. N. 36, 30.

[10] Jam. Min. 2. 130.

[11] H. N. 36, 53.

various sorts of lime, approves of that made of millstone (utilior e molari quia est quædam pinguior natura ejus.) It is probable, however, that the stones used in grinding differed in different countries, as they do at this day, and that they were often of the siliceous kind. Strabo observes that the lava of Ætna as it hardened upon cooling was converted into millstone, (λίθος μύλιας.)[1] He speaks of the island Nisyros as furnishing abundance of millstones,[2] and of a promontory called Melæna on the coast of Ionia, where there was a quarry of them.[3] It is not likely the geographer would have pointed out these two, and no other localities of millstone, if the substance they supplied had been one so far from scarce as common compact limestone. The name πυριμάχοι may be understood as implying that the stone so called resisted well the fire; and Saumaise assigns a like meaning to the term pyrites when applied to millstone; it signifying in this case, he thinks, not a stone that gave fire on percussion, but which withstood fire in a remarkable degree.[4] Both Aristotle and Theophrastus observe that these stones might be melted, and would flow; but we may infer from what the latter says that this had been observed where they had been used in the

[1] P. 629.

[2] These millstones of Nisyros seem to have been celebrated. See Commentators on Strabo, p. 488, and Eustathius' Scholia on Dionysius Periegetes, v. 526.

[3] P. 645.

[4] Exercit. Plinianæ, p. 505.

construction of furnaces for smelting metals; so that the fact of their melting under such circumstances may well consist with the belief that they were limestone, and with the remark which Theophrastus goes on to make that "there are indeed some who think all stones may be melted except marble, which being thoroughly burnt is converted into lime," (κονία.) And this ability of limestone to resist the action of fire, when by itself exposed to it, having been observed, may suggest a probable origin of the name πυρίμαχος, or fire proof, by which it seems to have been sometimes designated.

Such a millstone as was called pyrites for the reason assigned by Pliny,[1] "because there was much of fire in it," must, one would suppose, have been of a siliceous nature; and so, no doubt, they were in many instances. But the name pyrites, not confined to millstone, was applied to various minerals which gave sparks on percussion; as to the sulphuret of iron, now so called, with which pyritous copper was confounded,[2] and to flint, which was otherwise called lapis vivus,[3] and silex as by Virgil[4]

"Et silicis venis abstrusum excuderet ignem."

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[1] H. N. 36, 30.

[2] Pyrites, says Dioscorides, is a species of stone from which copper is melted, (5. 143.)

[3] Exercit. Plin. p. 505, a. F. [4] Georg. I, 135.

various sorts of lime, applied to the same purpose, were such as millstone (utilior e molari quam de ferro, quia ferrugine natura ejus.) It is probable that the former was the stones used in grinding the earthy nucleus: countries, as they do at this day, says Pliny, in the were often of the finest quality, unattainable otherwise to that the lava of Ætna distinguishes four was converted into the finest meal in respect to the speaks of the inferior quality of the kernel or nucleus dance of millstones.

Melæna on the coast of Asia the ancients comprehended, quarry of this stone, several other oxides of would have produced from Pliny's description of localities of iron besides the magnet.[3] For magplaced last here, so was classed with hæmatite;[4] because of the appearance it having been exposed to a strong observes that hæmatite was prepared from the magnetic been burnt for a sufficient time.[5] describes the hæmatite as occurring dry squalid appearance, and according to its name, coagulated kind, he observes, was called

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, 39.

ætites from *ἀετὸς* an eagle.

[4] Plin. 36, 25. [5] Dioscor. 5, 144.

so coagulated blood (*αἷμα πεπηγός*) by the Orphic and the reason is assigned,

ἐρυθρὸν ἡ χρὼς αὐτὸς ἐτήτυμος αἵματος ἐστιν
καὶ κεκαυμένα μᾶλλον ἐναργέστερον αἷμα
ἀπεργάζεται ——— (v. 654.)

ξανθή, from its being of a yellowish white. Dioscorides tells us it was sometimes found in the red ochre of Sinope.[1] Pliny too speaks of one hæmatites of a blood color (sanguineo colore) and another, by the Greeks called Xanthus, of a whitish yellow (e fulvo candicans.)[2] He has before said it was found in mines, and, when burnt, resembled cinnabar in color;[3] of one variety, that its streak was blood red; of another, that it sometimes resembled saffron.[4] From all which it is easily inferred that compact and ochrey red and brown oxides of iron were included under hæmatite.

The androdamas, one of Pliny's varieties of hæmatite, which was of a black color, of remarkable weight and hardness, and attracted silver, copper and iron, appears, when divested of its fabulous properties, to have been magnetic oxide of iron.[5]

The schistos lapis, by burning which, we find from Dioscorides,[6] and Pliny,[7] that the hæmatite was sometimes counterfeited, was probably an ochrey stone, of a slaty structure; whence its name. The best was of a somewhat saffron color, friable, fissile, resembling in structure and the

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[1] L. 5. c. 144.
[2] H. N. 37, 60.
[3] H. N. 36, 37.
[4] H. N. 36, 38.
[5] See Exercit. Plin. p. 774.
[6] L. 5. c. 145.
[7] H. N. 36, 37.

cohesion of its layers, the fossil salt, called ammoniac.[1]

Pumex signified, not only what we call pumice, but other eroded cellular stones, used in forming artificial grotto work;[2] and the corresponding Greek term, κίσσηρις, seems to have been equally indefinite. Theophrastus describes two varieties widely differing in character, and neither of them what is now called pumice: one, that of the island Nisyros;[3] soft and friable, easily crushed by the hand alone into a sort of sand; the other, found in the lava of Ætna, of a dark color, dense and heavy, resembling mill-stone.[4] He alludes to the opinion of those who, as he says, thought all pumice (κίσσηρις) the product of combustion, except that which was formed from the froth of the sea. This opinion was founded upon the appearance of the substance, its associations, and the places where it commonly occurs, in the neighborhood of volcanoes. For himself, he seems inclined to think that different varieties of it may differ in their origin.[5] The stone he calls Liparaean, (Λιπαραῖος) from the island Lipari, was no doubt obsidian, and he agrees with those who assign to it an igneous origin. "It is rendered porous by combustion, he observes, and becomes like pumice (κισσηροειδής); thus undergoing change, both as

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[1] Dioscor. 5, 145.
[2] Plin. 36, 42.
[3] Theoph. c. 36.
[4] Theoph. c. 40.
[5] Theoph. c. 34.

to color and density; for previous to such action of fire it is black, smooth, and dense. It occurs here and there imbedded in the pumice, but not continuous; just as in Milo pumice is, itself, they say, enveloped in another stone, which, however, is unlike that of Lipari.[1] Mineralogists are aware that pumice and obsidian occur in Lipari, intimately united, and passing into each other; and that in Milo, also, pumice is abundant.[2]

Pliny speaks of obsidian as having been used for mirrors placed in walls, and reflecting shadows instead of images;[3] and Beckmann remarks on the accuracy of this description of such mirrors.[4] Obsidian was also used for ring stones, and Pliny speaks of images and statues formed of it; but these are likely to have been of that factitious kind which he describes; a glass, made in imitation of obsidian. This mineral was found in various countries, as India, Italy, and Spain; but originally in Æthiopia, by one Obsidius, according to Pliny, who in this way derives its name. But as the Greeks called it ὀψιανὸς λίθος, Saumaise,[5] and Hardouin[6] prefer to derive its name, ἀπὸ τῆς ὄψεως, from its translucent nature.

Pliny describes it as of a very dark color, sometimes translucent; and an inedited Greek author

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[1] Theoph. c. 25.
[2] Cleav. Min. p. 306.
[3] H. N. 36, 67.
[4] H. of Inv. 3. 185.
[5] Exercit. Plin. p. 64.
[6] Notes on Plin. v. 9. p. 782.

cited by Saumaise,[1] as not very black, but inclining to green.

All that is said of the native obsidian of the ancients agrees so well with what we call obsidian, and, so little with any kind of marble, that it is surprising any should have supposed it to be Chian marble.

Among the stones which Pliny mentions as used for physicians' mortars, were the Etesius, the Thebaicus, the basanites and chrysites, the Taenarius, Pœnicus and Parius, lapides.[2] The lapis Etesius, which he prefers, was a species of porphyry;[3] as was also the Thebaicus, called pyropœcilus.[4]

The chrysites and basanites were, probably, one and the same thing; the basanite or Lydian stone being called chrysites from its use in testing gold.[5] The Taenarius, Pœnicus and Parius lapides, made use of for this purpose, were no doubt marbles.[6]

The stone of Siphnus, (the present Siphanto,) and that found at Comum, (now Como,) which, hollowed in the turning lathe, were formed into culinary vessels,[7] was that variety of steatite called pot stone, (lapis ollaris,) from the uses to which it was applied. This Siphnian stone is very par-

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[1] Exercit. Plin. p. 64. [2] Plin. 36, 43.

[3] Exercit. Plin. p. 776. b. C. [4] Plin. 36. c. 13, 43.

[5] Hesych. Word. χρυσίτις—Exercit. Plin. p. 776. We find Pliny too using the term coticula in one place, to denote a little mortar, (36, 13,) and elsewhere, for the basanite or touchstone, (33, 43.)

[6] Plin. 36, 43. [7] Plin 36, 44.

ticularly mentioned by Theophrastus, as capable of being turned and carved because of its softness, and as used to make vessels for the table.[1] Such vessels are still in very general use in certain countries; as amongst the Grisons;[2] in upper Egypt; in Greenland and on Hudson's Bay;[3] and at Zoblitz in Hungary, there occurs a serpentine, which is cut, turned, and polished into vessels that are distributed all over Germany.[4] To this Siphnian stone of Theophrastus and Pliny is closely related, no doubt, the Magnesian stone (μαγνῆτις λίθος) of the former author, which has been already mentioned.[5] Of that he says, it might be turned in the lathe, and resembled silver, though a wholly different substance. It was, probably, a steatite, invested or associated with a variety of talc exhibiting, as it sometimes does, a pearly, or what he calls, a silvery lustre. And the white ophites, before mentioned as a material of which hollow vessels were formed,[6] we may conjecture to have been of a like kind; especially since Pliny calls it soft, and mentions in the very next line the Siphnian stone.

Among the many varieties of whetstone which Pliny says there were, he specifies the Cretan and Lacedæmonian as requiring oil; the Naxian and

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[1] De Lapid. c. 74. [2] Cleav. Min. p. 442.
[3] Jam. Min. 1, 516.—Brongn. Min. 1, 487.
[4] Jam. Min. 1, 510. [5] See before page 115.
[6] See before page 81.

Armenian, used with water; and the Cilician, with which either might be used.[1] The first mentioned were probably the novaculite; a mineral first brought into Western Europe from the Levant, and still sometimes called Turkey stone. The others are to be referred to the various substances still applied to the same use; such as argillite, gray wacke slate, mica slate, and sand stone.

The smyris (σμύρις λίθος) of Dioscorides, "a stone with which the engravers of gems polish stones;"[2] and which Hesychius describes as "a sort of sand with which the harder stones are polished," is thought to have been emery.[3]

All that Theophrastus says upon this subject is that the stone with which seals are engraved is of the same substance with, or resembles that of whetstones, (ἀκόναι) and comes from Armenia.[4]

OF MINERAL SUBSTANCES THAT WERE CLASSED WITH GEMS.

The branch of our subject in which the ancients were, perhaps, least deficient, is that relating to the stones commonly called precious. These do not in our mineralogy constitute a separate class: there being great dissimilarity amongst them in some important characters: but their agreement as to others; their superior weight, lustre, and

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[1] Plin. 36, 47. [2] Dioscor. 5, 166.
[3] See Hardouin Notes on Pliny, vol. 10. p. 173.
[4] Theoph. c. 77.

hardness, together with their comparative scarceness, have, in common discourse, assigned to them a place apart from more vulgar minerals.

This consideration, it appears, led Pliny to treat of them in a separate book; the 37th and last of his great work; and though he does not, even here, confine himself very closely to his subject; yet has he here, made several attempts at classification. In the first place, he arranges according to their several colors the more valuable gems; comprehending in this list almost all the stones that are recognised by us as precious; together with many that are not. We are then presented with four other lists. The first, a numerous one, contains, exclusive of varieties specified under several of the heads, no less than one hundred and fifty-five names alphabetically arranged. The next is of a few minerals which derive from parts of the body their distinctive appellations. The third is of those named after certain animals; and the last, of such as are denominated from other natural objects.

In the alphabetical list, we find here and there a mineral sufficiently characterized to determine what it was; but as to far the greater part of them, we remain wholly uncertain to what species in the mineralogical systems of the present day they would have been referred. There is, however, reason to believe, that in these lists of gems, a large proportion of the crystallized specimens in modern cabinets, would have found their appro-

priate place and name. Many such crystallized minerals, which by their color, form and lustre, could not fail to attract attention, must undoubtedly have been known to ancient naturalists; but have passed without notice unless they are, as is here conjectured, included in these lists. New species and new varieties must have occurred anciently from time to time as now; and it is of such, no doubt, our author speaks, when he says that new and nameless gems were sometimes unexpectedly discovered.[1]

Pliny dates from Pompey's victory over Mithradates, the introduction into the Roman state of a taste for pearls and Eastern gems, as also of the vessels called murrhina.[2] What these murrhina were, has been a question much debated, and the controversy does not appear to be as yet decided; though Sir Wm. Gell says, that, "they seem at last to have been successfully traced to China. Propertius calls them Parthian,[3] and it seems certain that the porcelain of the East, was called mirrha di Smyrna to as late a date as 1555." This opinion of Sir Wm. Gell, is the one long ago maintained by Saumaise,[4] and seems more probable than any other. Two conjectures mentioned by

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[1] Plin. 37, 74. [2] Plin. 37. c. 6, 7.

[3] Propert. 4, 5, 26. And what Propertius says of them agrees perfectly with the belief that they were porcelain.

"Murrheasque in Parthis pocula cocta focis."

[4] Exercit. Plinianæ p. 144.

Jameson;[1] that of Baron Veltheim, that they were figure-stone; and another that they were concentrically striped onyxes; are undeserving our consideration; being wholly inconsistent with the greater part of what is said about murrhina by the ancients. All that Pliny remarks concerning them, as of his own knowledge, will agree with the idea that they were formed of a whitish opaque opalescent glass, or of very fine china.[2] That they came from the East was certain; but all that was said further about their origin seems to have been mere conjecture. Thus the Romans used cœruleum Indicum, (Indigo), and atramentum Indicum, (Indian Ink), without any knowledge of the nature of these substances;[3] and wore silk for centuries before they learnt that it was not combed from the leaves of trees.[4] Pliny elsewhere speaks of murrhinum, as one of the many varieties of glass that were manufactured; as a black and opaque glass, to resemble obsidian; an opaque red glass, called hæmatinon; and white; and murrhine; and like the hyacinth; and the sapphire; and of every other color; though the most esteemed, he says, was that of a pure transparency, and as much as possible resembling crystal.[5]

As for rock-crystal, it was the universal opinion

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[1] Min. v. 1. p. 207, 502.
[2] Plin. 37, 8.
[3] See before p. 67, and Plin. 35, 25.
[4] Virg. Geor. 2, 121—Plin. 6, 20.
[5] Plin. 36, 67.

of ancient naturalists, and the belief, indeed, a
to our own time, that it was water congeal
that hardness, by long continued and intens
"That it is ice is certain, says Pliny, and
the Greeks have given it its name."[1] T
cient notion will appear less ridiculous if
sider that, although water really convert
solid crystalline mass, by exposure to a
dinary degree of cold, resumes its fluid s
the heat of which it was deprived is agai
yet the results of chemical analysis tea
water in a permanently solid state, co
considerable proportion of many crys
stances. Of the hydrate of magnesia
ple, it forms very near one third; an
phate of soda considerably above one
crystal is one among the very few mi
crystalline form Pliny has remarked,
that, "it is not easy to ascertain th
crystal is produced in six-sided pris
lis lateribus), especially since the t
not uniform."[2] That drinking ves
of it, proves in their lapidaries a
skill; and the perfection to whi
ture of glass had been brought
may be inferred from his remark,
had approached to a wonderfully
of the crystalline; while cryst

[1] Plin. 37, 9.—Sen. Nat. Quæst. 3, 25.
[2] Plin. 37, 9.

ing, had increased, instead of diminishing in value.[1] He mentions one remarkable use of crystal, in applying actual cautery. "I find, says he, that physicians if there are parts of the body to be burnt, think that this cannot be more advantageously done than by means of crystalline balls opposed to the solar rays."[2] This use of a crystalline lens is a very ancient one, if the ὕαλος of Aristophanes was, as the best commentators take it to have been, rock-crystal. Strepsiades asks Socrates if he had ever observed, among those who sell medicines, that beautiful transparent stone, with which they kindle fire. You mean crystal, (ὕαλον) says Socrates. I do says he. And, upon Socrates asking how he intends by means of that, to get rid of the suit for five talents brought against him, he says that taking this stone, he will, when the clerk is writing down the accusation, stand off towards the sun and so melt out the letters.[3] The use of crystal as a burning lens is also very particularly mentioned in the Lithica of

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[1] Plin. 37, 10.

[2] Ibid. He elsewhere (36, 67.) speaks of hollow balls of glass, filled with water, setting fire to clothes; as does Lactantius also, (De Ira Dei. c. 10); and Seneca remarks of such glass balls, that "letters, though small and indistinct, appear when viewed through them, enlarged and more distinct." (Nat. Quæst. 1, 6.) This passage might be adduced as among those which favor Winckelmann's conjecture, that the ancients made use of convex lenses in engraving gems. (See Stor. delle A. del D. v. 2. p. 20, and note thereon.)

[3] Aristoph. Nub. v. 768, seqq.

Orpheus, a poem of uncertain date, tl
ken and Hermann would assign it t
age.[1]

The poet, having described "the
crystal, an emanation of divine li
bids you, "if without fire you would
to hold it above a dry torch, oppo
ing sun. "Immediately it will
torch a slender ray, which, tou
fuel will produce smoke, then
finally a bright flame; while
though the cause of fire, remain
The poet alludes to the same
saying of the lychnis that it c
without fire kindle flame.

Under the head of cryst
the mention of a stone call
chrysothrix, or goldenhair
two varieties; the one li
sembling chrysolite; than
containing bright rays
stones were probably
sometimes does, capilla
or acicular crystals of
goldenhair might be
same, with the Venus
traversed by such
oxide of titanium.[5]

[illegible] Peric
[illegible] H.
[illegible] qu
[illegible] 15. –S

[1] Orphica, ex edit Herm.
[3] Lith. v. 271.
[5] Cleav. Min. p. 236.

It is probable that Pliny, when speaking of the gem called adamas,[1] had in view, amongst other things, the diamond; but it is plain from the fables he relates of it, that this substance "of highest value, not only amongst gems, but all human things, and for a long time known to kings only, and to very few of them," was unknown to him.

He has evidently confounded in his description several widely different minerals; to which, from their hardness, or their, in some respect or other, indomitable nature, the Greeks gave the name ἀδάμας, adamant. Thus steel was very frequently so called;[2] and those grains of native gold, which, when the gangue containing them was reduced to powder in a mortar, resisted the pestle and could not be comminuted by it, were called adamas.[3] Something of this sort Pollux meant by that flower of gold, or choicest gold (χρυσοῦ ἄνθος), which he calls adamas;[4] and Plato, too, by the "branch or knot of gold (χρυσοῦ ὄζος), which, from its density very hard, and deep colored, was called adamas."[5] It was, no doubt, this native gold that was spoken of in the authors from whom Pliny drew when he wrote that—adamas is found in gold mines—that it accompanies gold—that it seems to occur nowhere but in gold—that it is not larger than a cucumber seed, nor unlike to it in color.

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[1] H. N. 37. 15.

[2] Ἀδάμας. γένος σιδήρου. Hesych. and see Stanley's Comment. on Æsch. Prom. Vinct. v. 6.

[3] Plin. Exercit. p. 757.

[4] Onom. l. 7, § 99.

[5] Tim. v. 7, p. 57, edit. Tauch.

Of the six kinds he mentions, that described as occurring in India, not in gold, but bearing some resemblance to crystal, may have been the diamond; though even here it is probable that he, and those from whom he copies, mistook fine crystals of quartz for diamond; or, rather, call such crystals, adamas. The description given is precisely that of a crystal of quartz in which the prism has entirely disappeared, leaving a double six sided pyramid upon a common base.[1]

The manner in which Dionysius Periegetes characterizes adamas may lead us to suspect that he also spoke of crystals of quartz; for the diamond in its unpolished state, as known to the ancients, would hardly have been styled all-resplendent (παμφανόωντα),[2] and afterwards, brilliant (μαρμαίροντα).[3] The locality in the former case, too, being Scythia.

The variety of adamas which Pliny calls siderites was magnetic iron ore;[4] and the Cyprian was probably emery, or some similar substance used in engraving gems.[5]

There is a strange jumble of truth and fable in what Pliny says of the hardness of adamas; which was so unspeakable that it could not be

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[1] Plin. 37, 15.

[2] Dion. Perieg. v. 318.

[3] Ibid. v. 1119.

[4] Exercit. Plin. p. 773, 774.—Jam. Min. 1, 41.

[5] According to Saumaise, who would read "qui e Cypro venit," for "quod et Cyprio evenit," in Plin. 37, 15. –See Exercit. Plin. p. 774, a F.

crushed; but would split hammers and anvils used in the attempt. This invincible substance, however, which resisted the violence of fire, and the force of iron hammers, might be so far softened by steeping it in fresh warm goats' blood, as to render it possible with repeated blows to break it; though to accomplish even this, the best of hammers and anvils were required. And being thus broken, it was reduced to the smallest and scarce visible particles; which, sought after by engravers, and enclosed in iron, would readily cut into the hardest substances. The localities of the several varieties of adamas, were Æthiopia, India, Arabia, Macedonia, Cyprus, and Germania.

Beckmann thinks the iaspis of Orpheus[1] may have been diamond; for the poet, he remarks, "compares his iaspis to rock-crystal, and says that it kindles fire in the same manner."[2] But the learned antiquary was led astray by a false reading; for the poet compares not the iaspis, but the lychnis, to rock-crystal, and by a poetical exaggeration ascribes to it the same power of kindling fire.[3] Beckmann further conjectures that "the iaspis in the Revelation of St. John, described as

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[1] Lith. v. 264. [2] Beck. Hist. of Inv. 4, 238.

[3] The true reading unquestionably is Λύχνι, σὺ δ' instead of Λύχμης δ'. (See Hermann's edition of the Orphica.) This stone, λυχνὶς, Dionysius Periegetes (v. 329) describes as altogether resembling flame (πυρὸς φλογὶ πάμπαν ὁμοίη), and it was from this fiery splendor of the stone itself, perhaps, that the Orphic poet was led to ascribe to it such virtue.

a costly, transparent, crystalline stone, was perhaps our diamond, which was afterwards every where distinguished by that name."[1]

No mineralogist, who reads what Pliny says of the smaragdus, can fail to see that he classes together under that name, several wholly different minerals; but what they were, it is not easy to determine. Having assigned the superiority amongst gems to the adamas, he places next in value pearls, which also he regards as gems; and the third rank he assigns to the smaragdus. Of this he enumerates twelve kinds: first the Scythian, second the Bactrian, and third the Egyptian; and with one or other of these three our emerald if found amongst the smaragdi, would probably be classed. The other kinds, he says, were found in copper mines; the best in those of Cyprus; and the characters which he ascribes to certain of them agree so well with those of malachite, that we can hardly doubt that this mineral was classed with his smaragdus. For of those smaragdi which were obtained in copper mines, some were not translucent; were of various shades of green; resembled the eyes of cats or panthers (that is, were, as modern mineralogists express themselves, chatoyant).[2] Though Pliny does not here contradict Theophrastus in any point, yet it is evident that he is compiling from

[1] Beck. Hist. of Inv. 4, 239.

[2] Plin. 37, 18.

some other source. The latter author states[1] that "of known and accessible places there are two where chiefly the smaragdus occurs; the copper mines of Cyprus and the island over against Carthage;[2] where they are found more separate and distinct; since in Cyprus it is mined for as other mineral substances are, and in many veins where they seek for it alone. But it is rarely found of sufficient size for a seal, or ring stone; they use it, therefore, to cement on gold; for it unites with the metal as chrysocolla does;[3] and some, indeed, think them of the same nature, since they are much alike in color; but chrysocolla is abundant in gold, and yet more in copper mines, while smaragdus, as has already been observed, is rare." He adds that "it appears to be formed from jasper (iaspis); for that it was said there had been found in Cyprus a stone, of which the one half was smaragdus, and the other half, iaspis which the water had not yet changed." He concludes by remarking that "some labor must be bestowed

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[1] De Lapid. c. 49.

[2] Saumaise would read Chalcedon here instead of Carchedon, (Carthage).

[3] This, though not the usual translation, is, perhaps, the best sense we can put upon a passage far from being clear. It is so understood by Kidd (Min. 1, 120); and Saumaise (Exercit. Plin. p. 128, b F) seems to interpret it in the same sense with a passage which afterwards occurs (c. 63), where Theophrastus speaks of the Bactrian smaragdi as being small and used εἰς τὰ λιθοκόλλητα, that is, vessels of gold or silver, to the plain surface of which precious stones were firmly attached, by a plain surface, with cement; as is still practised in Armenia, and perhaps elsewhere.

upon the smaragdus to give it polish, for in its natural state it has no lustre."

This mineral found in the mines of Cyprus, half emerald and half jasper, which is mentioned by Pliny also,[1] may have been arseniate of copper, accompanied, as it sometimes is, by red oxide of the same metal.[2] The Median emeralds "were very green, and partook sometimes of the sapphire; that is, perhaps, had the blue carbonate mingled with the green. Some were fragile; of a changeable color, resembling the green feathers of the peacock's tail, or the pigeon's neck;[3] or, in modern terms, exhibited a pavonine or columbine tarnish; such as pyritous copper often does. These same emeralds were scaly, and contained veins. The chalco-smaragdus, classed with the smaragdus,[4] and described as confusedly veined with brass, was no doubt malachite with pyritous copper. There are several other minerals which one familiar with their characters may see indicated by some part or other in Pliny's description of smaragdus; as chrysoberyl,[5] chrysoprase, prase,[6]

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[1] H. N. 37, 19. [2] Cleav. Min. p. 565.

[3] In caudis pavonum columbarumque collo plumis similes. Plin. 37, 18.

[4] Plin. 37, 19.

[5] Our chrysoberyl is not the mineral designated in Pliny by that name; as will appear hereafter under the head of beryl.

[6] A well chosen specimen of prase, when cut, affords a tolerable imitation of the emerald (Min. des Gens du Monde, p. 151).

plasma,[1] diallage,[2] fluor-spar,[3] green jasper, green obsidian,[4] and dioptase or emerald copper ore.[5] This last mentioned has a fine emerald color, is more or less translucent, and its crystalline form is a six sided prism: particulars in which it bears sufficient resemblance to the emerald to justify us in supposing that, if known to the ancients, they were comprehended under the same name. Dioptase is now found chiefly in Siberia, and if brought anciently from the same quarter, will have been classed with the Scythian emerald, which ranked first in value. But this and other minerals occurred anciently, no doubt, in other localities than those in which they are at present found. We every now and then hear of localities that have become exhausted; and sometimes within a few years, perhaps, from the time when they were first discovered and explored. The same thing must have happened occasionally in former times; so that in some cases we may be taking fruitless pains to determine minerals, that never have been

[1] Plasma is the prime d'emeraude of some authors. It was considered by the Romans as a gem; was cut into ornaments, and frequently engraved.—(Jam. Min. 1, 214.)

[2] Diallage is still called by many mineralogists smaragdite, and sometimes emeraudite.

[3] Beckmann thinks the mirror of smaragdus, in which Nero viewed the gladiatorial combats (Plin. 37, 16), may have been green obsidian, green jasper, or even green glass (Hist. of Inv. 3, 177).

[4] Green fluor-spar is called by Haüy émeraude de Carthagéne (Tr. de Min. 2, 185).

[5] Dioptase Haüy calls émeraude, and émeraudine (Tr. de Min. 2, 65).

seen by moderns; the localities whence only they were obtained having many ages since become exhausted or unknown.

As for the statues, obelisks, and pillars formed of emeralds of prodigious size; mentioned by Theophrastus, Pliny, and others; they were of some one or other of the several more abundant minerals, that have been above suggested; or else of colored glass. Larcher thinks the pillar of emerald, which Herodotus saw in the temple of Hercules at Tyre, and which shone at night,[1] was a hollow cylinder of glass within which lamps were placed.

Theophrastus himself, speaking of this column, suggests that it may be a false emerald; for such, says he, there are.[2] And such are there, even at the present day, which pass for native stones. Beckmann says that a piece of glass in the monastery of Reichenau seven inches long, and weighing twenty-eight pounds, and a large cup at Genoa, which is however full of flaws, are given out to be emeralds, even to the present time.[3]

It is very probable that our emerald ought not to be reckoned among the many varieties of smaragdi mentioned by the ancients. Dutens doubts if it was known to them; and from the researches, and the positive assertion of Tavernier, it appears, at least, that no locality of emerald is known in Asia or its islands.[4]

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[1] Herod. 2. 44.
[2] De Lapid. c. 45.
[3] Beck. Hist. of Inv. 3. 189.
[4] Brongn. Tr. Elem. de Min. 418.

With respect to the beryl (beryllus,) Pliny rightly observes that "many regard it as of the same, or certainly of a like nature with the emerald."[1] He seems to think its crystalline form due to the lapidary's art; but adds, that some suppose them to be naturally of that shape.[2]

The best were those of a pure sea green, (qui viriditatem puri maris imitantur) our aqua-marina, beril aigue-marine.[3] The next in esteem were called chrysoberyl, and are somewhat vaguely described as "paulo pallidiores, sed in aureum colorem exeunte fulgore." This was probably the yellow emerald, such as occurs in Auvergne, or at Haddam in Connecticut. The third was called chrysoprase; and would seem to have been, in fact, as Pliny says some considered it, a mineral *proprii generis*, different from the beryl. It resembled in color the juice of the leek, but with somewhat of a golden tinge, and hence its name.[4] Although we are uncertain as to the mineral here described, yet it is not improbable that it was the same now called chrysoprase, and to which Lehman was the first in modern times who gave the ancient name.[5] The fourth variety of beryl was

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[1] H. N. 37. 20.

[2] Poliuntur omnes sexangula figura artificum ingeniis—quidam et angulosos putant statim nasci. (H. N. 37. 20.)

[3] Dionysius Periegetes calls it ὑγρῆς βηρύλλου γλαυκὴν λίθον, that is, according to Eustathius, sea-green; and afterwards merely βηρύλλου γλαυκὴν λίθον.—vv. 1012, 1119.

[4] Plin. 37. c. 33, 34.

[5] Jam. Min. 1, 202.

of a color approaching the hyacinth; the fifth of a wax, and the sixth of an olive color. The last variety spoken of by Pliny resembled crystal; but contained hairy threads and impurities (crystallo fere similes — capillamenta habent sordesque.) These were probably such crystals of quartz as are often found, rendered partly opaque by chlorite, or penetrated by capillary crystals of epidote, actinolite, or other minerals. Pliny observes that the Indians stained rock-crystal in such a way as to counterfeit other gems, and especially the beryl.[1]

The opal (opalus) of Pliny is too well characterized, and its peculiar lustre, or opalescence, too accurately described by him, to leave any doubt that it was what we call precious opal. He first speaks of it in the order in which the great value ascribed to it entitled it to rank; in the first class of gems.[2] Afterwards, when speaking of gems according to their respective colors, he introduces it again, as taking the lead among white gems (dux candidarum,) under the name of pæderos;[3] by which name he had before said it was, because of its extraordinary beauty, more generally distinguished.

Pliny is not the only one among the ancients, as Jameson supposed, who makes mention of this gem. The Orphic poem commends the beauty of the ὀπάλλιος; and evidently alludes to its other

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[1] H. N. 37. 20.
[2] Plin. 37. 21.
[3] Plin. 37, 46.

name, pæderos (παιδέρως,) in saying that it has the delicate complexion of a lovely youth, (ἱμέρτου τέρενα χρόα παιδὸς.)[1] This gem also, Pliny says, the Indians so well imitated in glass that the counterfeit could hardly be detected. The opal was perhaps too highly valued to be frequently engraved. There are very few engraved specimens of this mineral preserved in collections.[2] But that it sometimes was used as a ring-stone, we learn from the story Pliny tells of a senator named Nonius, who possessing an opal valued at twenty thousand sesterces, which Anthony coveted, was proscribed in consequence, and fled, saving of his whole fortune this ring alone, (e fortunis suis omnibus anulum abstulit secum.)[3]

The sardonyx (sardonyches,) mentioned by Pliny next after opal, as holding the next rank, was evidently the same stone with that now so called. But under the same denomination seem to have been comprehended other varieties of chalcedony, and especially the carnelian which Werner calls sardonyx, whose colors are in alternate bands of red and white, and when the stone is cut in certain directions, resemble the flesh seen through the finger nail.[4] The first Roman who sealed with a sardonyx was the elder Scipio Africanus; from whose time this sort of gem was much used for that purpose; it being almost the

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[1] Orph. Lith. v. 280. [2] Jam. Min. 1, 233.
[3] Plin. 37. 21.
[4] Velut carnibus ungue hominis imposito, (Plin. 37. 23.)

only one which left a fair impression and brought away with it no portion of the wax.[1] This gem was most approved when it exhibited distinct colors, and bands well defined. The localities mentioned by Pliny are India, Arabia, and Armenia.

The gem onyx seems to have comprehended several varieties of agate; as the onyx-agate, and the eyed-agate.[2] The name, derived from a certain resemblance to the human nail, was applied originally to the calcareous alabaster before mentioned; the substance meant whenever unguent vessels are spoken of as made of onyx.[3] From that it was afterwards derived to the gem, or ring-stone onyx.[4]

The sard (sarda) of Pliny is what we call carnelian. By remarking that it was first found at Sardes, he means, probably, to suggest the origin of its name; which others prefer to derive from Sardinia, where Kircher says, that very good ones are obtained.[5] Epiphanius says, it received its name from some resemblance which it bore to the fish called sardine, (σαρδίῳ ἰχθύϊ παραρίχευμένῳ.)[6]

The best sards had been gotten from near Babylon, in working certain stone quarries, where

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[1] Plin. 37. 23.

[2] Cingentibus candidis venis oculi modo. (Plin. 37. 24.)

[3] See before p. 124.

[4] Plin. 37. 24. Used in this latter sense the word is of the feminine gender, as in the former it is masculine. The word gemma being understood in the one case, and lapis in the other. (Plin. ubi supra et Exercit. Plin. pp. 393, 396.)

[5] Mund. Subterr. lib. 8. p. 81. [6] Epiph. de 12. Gemmis p. 22.

it was found enveloped in the rock; but that locality, Pliny says, had failed. It was, however, a common gem, and occurred in many other places. There was no one, Pliny says, more frequently employed among the ancients; and by referring to the plays of Menander and Philemon, to confirm his assertion, he gives us to understand whom he means to designate as ancients. He speaks of one of the three kinds brought from India as being underlaid with silver foil when set; and of another kind from Egypt under which gold foil was laid. The favor this gem enjoyed as a ring-stone was in consequence of its making, like the sardonyx, a clean impression, and bringing away no portion of the wax.[1]

Under the head of glowing gems (ardentes gemmæ) Pliny classes a considerable number; and assigns the first rank amongst them to carbunculi.[2] The carbunculus of Pliny is said by some to have been the ruby, while others regard it as the garnet; and both opinions, probably, are right. The Latin name seems, like the term ruby, to have been applied to very different minerals; and may have comprehended the red sapphire, or oriental ruby; the spinelle ruby; the red topaz, or Brazilian ruby; the Bohemian ruby (a variety of red quartz;) red fluate of lime, called the false ruby; together with several varieties of garnet.

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[1] Plin. 37. c. 24, 31.

[2] Plin. 37. 25.

Those carbuncles, which Pliny calls Alabandic, because they were cut and polished at Alabanda,[1] were precious garnets, still called by some mineralogists Alabandines, or Alamandines. What he afterwards says of Alabandic carbuncles, which were darker colored, and rougher than others, may be explained by supposing that near Alabanda both precious and common garnets were obtained.

Those Indian carbuncles which he describes as "non claros, ac plerumque sordidos, ac semper fulgoris horridi," and which had been hollowed into vessels that would hold a pint (sextarii unius mensuram,) were common garnets; which are sometimes found of considerable size, as large even as a child's head.[2] It is evident that there are still other minerals besides these, among the carbunculi; but what those minerals may be, it is not easy to determine.

Pliny observes, that these gems were so easily imitated in glass, something being placed underneath to improve its lustre, that to distinguish the false stones from the true was very difficult; though, like other factitious gems, they might be detected by the lapidary's wheel; their greater softness and fragility; and their inferior weight.[3]

Theophrastus uses the name ἄνθραξ (carbunculus) in a somewhat more restricted sense. Having

[1] Alabandicos in Orthosia caute nascentes, sed qui perficiantur Alabandis. Plin. 37. 25.

[2] Cleav. Min. p. 367.

[3] Plin. 37. 26.

spoken of combustible minerals, he goes on to point out some that are wholly incombustible; and first the carbuncle, (ἄνθραξ,) which, he observes, is engraved for seals, and describes as of a red color, and when exposed to the rays of the sun resembling a burning coal. It may be called very precious, he remarks, since a very small one sells for forty pieces of gold. This kind was brought from Carthage and Marseilles. Another kind, alike incombustible, occured near Miletus, angular, and sometimes hexagonal, which also was called carbuncle (ἄνθραξ.)[1] The ἀνθράκιον, which he afterwards describes,[2] probably comprehended some varieties of common garnet, and perhaps schorl.

The anthracites, described by Pliny among these glowing gems,[3] may be micaceous oxide, or scaly red oxide of iron. The latter is sometimes seen in cavities of the red hæmatite,[4] between which and anthracites there seems to have existed some connexion.[5] By its being "carbonibus similes," Pliny must mean, that it possessed a fiery lustre, a glow resembling that of coals, and which he presently describes as "igneus color." That when thrown into the fire these anthracites "velut intermortuæ extinguuntur, contra, aquis perfusæ exardescunt," means, probably, that their

[1] Theoph. c. 31, 32.
[2] Theoph. c. 61.
[3] H. N. 37. 27.
[4] Cleav. Min. p. 601.
[5] See Plin. 36, 38. & Dalecamp's notes thereon. Agricola makes the anthracites a species of hæmatite.

transparency and lustre are destroyed by casting them into the fire, but improved by sprinkling them with water; which is true.

The sandaresus and sandaster[1] were perhaps varieties of aventurine quartz, which occurs of all the colors ascribed by Pliny to these stones: red, as they probably were to be classed with carbunculi—yellowish brown, or resembling smoky topaz (fumido chrysolitho similes)[2]—yellow, or "mali coloris"—and greenish, or with the color "olei viridis." The transfulgent drops of gold, seen, never on the surface but always in the body of the mineral, were what mineralogists now describe as "brillant points or spangles, which shine with a silver or golden lustre, and seem to be produced by the reflection of light from numerous fissures; or from disseminated plates of mica; or perhaps from laminæ of quartz interspersed through the mass.

The lychnis, so called from some resemblance to the flame of a lamp,[3] or from its peculiar lustre when viewed by lamp light, was of several kinds, distinguished by their colors; as pale red, violet red, crimson red. In which respect, and as to the localities whence it was obtained, it agrees well with the rubellite. But the chief point of resemblance to this mineral is its possession of

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[1] Plin. 37. 28.

[2] The chrysolithus of Pliny was our topaz; as will appear hereafter, under the proper head.

[3] Plin. 37. 29.

electric properties, observed by Pliny; who says, that when heated in the sun or by friction it attracts chaff and leaves of paper, (chartarum folia.)[1] Nor, should this be thought a sufficient ground for believing lychnis to be rubellite, need that belief be invalidated by what our author, in the following chapter, says, that drinking vessels had been made of lychnis, and of the mineral he is there speaking of, Carchedonius; for he in the very next sentence adds, that "all these gems obstinately resist the graver's tool;" which seems wholly inconsistent with their being hollowed into drinking vessels. They may perhaps have been used as other gems were in ornamenting such vessels, which were thence called λιθοκόλλητα.

The Carchedonius, which occurred in the mountains of the Nasamonæ, and was taken thence to Carthage, from which city it derived its name, is supposed by some commentators on Pliny[2] to have been what we call Chalcedony, but the characters assigned to it by Pliny do not warrant such opinion. Like the Carthaginian carbuncles (carbunculi Carchedonii) spoken of before,[3] it had its name from Carthage (Καρχηδών,) but it seems to have been a different mineral;[4] and from its possessing electricity, though in slighter degree than the lychnis; from its brittleness; and its

[1] This property led Beckman to suppose it might be tourmaline. (Hist. of Inv. 1. 144.)

[2] Hardouin in Plin. v. 10. p. 88. et Salm. Plin. Exercit. p. 270 aF.

[3] Plin. 37. 25.

[4] Plin. Exercit. p. 270 a D.

resemblance to expiring coals, (in blackness probably,) we might not unwarrantably infer that it was shorl. There is, indeed, one argument against this supposition, and in favor rather of its being the above mentioned variety of carbunculus; which is, that Pliny classes it with the gems he styles ardentes;[1] and which, after having spoken of sardonyx, he considers by way of digression before treating of the sarda, because they all agreed in certain particulars, as to which they differed from the sard. They were all of them engraved with much difficulty, and when used as signets, retained and brought away with them a portion of the wax; while the sard, on the contrary, was well suited to this use.

The topaz, (topazius,) which Pliny speaks of as a gem of a peculiar green color, (suo virens genere,[2]) which even in his time retained a high value, but was upon its first discovery preferred before all others, is supposed by some to have been the same with our chrysolite;[3] as his chrysolite is considered by Werner and others, to have been the stone which we call topaz.

This name is derived from that of the island Topazos, in the Red Sea; whence it was originally brought. Juba[4] derives the name of the island itself from τοπάζω, *to conjecture*, it being often hid in mist, and mariners consequently at a loss

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[1] Plin. 37. 24.
[2] Plin. 37, 32.
[3] Jam. Min. 1, 48.
[4] Cited by Plin. 37, 32.

to find it.[1] Pliny styles his topaz, largest of gems, (amplissima gemmarum,) and speaks of a statue of Arsinoe, wife of Ptolemy Philadelphus, made of it, four cubits high; which seems wholly inconsistent with its being chrysolite, although a variety of this mineral, called olivine, has been found in masses of considerable size.

The extraordinary dimensions ascribed to Pliny's topaz, have led some to think it was a variety of jasper, or of agate. Pliny says that it alone, of the nobler gems, could be touched by the file; and that recent authors distinguished two kinds of it; one having the color of the leek, and therefore called prasoïdes; the other, more inclined to a golden color, styled chrysopteros, and resembling chrysoprase.

Pliny's whole description of the topaz is perhaps as applicable to the minerals which we call prase and chrysoprase, as to any that we know.

Bruce mentions an island in the Red Sea, called Jibbel Seberget, or the Mountain of Emeralds; but says the substance he there met with was little harder than glass. Kidd asks, may not this have been chrysolite, and the island the Topaz island of Pliny?[2]

Bruce himself conjectures that this green pellucid crystalline mineral, as he describes it, was classed with the smaragdi of the ancients.[3]

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[1] For a strange account of this island, and the topaz it produced, see Diod. Sic. lib. 3. c. 38.

[2] Min. 1, 121.

[3] Bruce's Travels, v. 1. c. 9.

The color, and other characters, as far as they are given, of Callaïs, agree very well with the belief, that it was what we call turquoise. Pliny says[1] it was of a pale green, (e viridi pallens); that its best color was that of emerald; that it occurred in roundish masses, (oculi figura extuberans); and in regions of Asia which are the same with those whence the turquoise is now brought. The story Pliny tells of its being obtained by means of slings from lofty and inaccessible rocks, to which it feebly adhered, projecting above their surface, we may be permitted to regard as a fable, not to be taken into consideration.

Of this gem also, he observes, that there was no one more perfectly imitated in glass.

Prasius, a green stone, of inferior rank,[2] was probably our prase; and that second kind of it, which was horrid with spots of blood; and the third kind, distinguished by three light colored stripes, were two varieties of heliotrope. Some, says Pliny, prefer to these the chrysoprase, which also resembles in color the juice of the leek, but from that of topaz inclines to that of gold. To this chrysoprase, which he has before spoken of as a variety of beryl, he ascribes such dimensions that cups (cymbia) were sometimes formed of it. It is most probable, as has already been observed,[3] that this was like the stone of Kosemütz, which Lehman first called chrysoprase.

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[1] H. N. 37, 33. [2] Plin. 37, 34. [3] Page 151.

The prasites of Theophrastus,[1] of which he merely observes that it was somewhat like verdigris in color, (ἰώδης τῇ χρόᾳ,) may have been the same mineral.

The Nilion,[2] so called from the river Nile, on the banks of which it occurred in Æthiopia; without lustre, dull, of the color of smoky topaz, and sometimes of honey, was perhaps jasper.

The molochites,[3] malachite, so called from μολόχη or μαλάχη, mallows, which it resembled in color, is described as opaque, of a deeper and duller green than the smaragdus. We may, nevertheless, regard it as the mineral still called malachite, and which, as we have seen, Pliny classes with smaragdi.[4] He may here again introduce it under a different name, among the green minerals he is now describing, because he finds it mentioned in the authors now before him; for he often looks no farther than the source from which at the time he happens to be compiling.

Iaspis, says Pliny,[5] is green, and often is translucent. What we call jasper is of almost every color, and is opaque. But still, the ancient iaspis may have comprehended certain varieties of green jasper; and since agate and jasper are closely connected, and pass into each other, it is probable there were varieties of agate also, classed under the same head. The Orphic poem, speaking of the

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[1] De Lapid, c. 65. [2] Plin. 37, 35. [3] Plin. 37, 36.
[4] Before, page 146. [5] H. N. 37, 37.

various colors of the agate, says, "You recognise therein the glassy jasper, the blood-red sard, and the brilliant emerald."[1] The iaspis found in Persia, and described as resembling in color an autumnal morning sky, and hence called aërizusa, is thought by some to have been our turquoise; but Beckmann is decidedly opposed to this opinion, and supposes it to have been blue jasper.[2] Jameson may say with truth, "we are ignorant of the particular stone denominated jasper by the ancients;"[3] for certainly there is no one stone to which the description of jasper could be applied; but in this case, as in others, it is evident that several different minerals were comprehended under a single name. One variety specified by Pliny, "stellata rutilis punctis," resembles a jasper not uncommon at this day, of a dark green color, with red spots; and like heliotrope, except that it is not translucent. All the East, Pliny says, wore as amulets that variety of jasper which resembled emerald, and had a white stripe running through the midst of it, and was therefore styled grammatias; as that which had several such stripes was called polygrammos. Here, again, he describes what we may easily recognise as striped jasper; a mineral which abounds in many countries.

Pliny classes with jasper certain stones, which

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[1] Lith. v. 607.

[2] See Salm. Exercit. Plin. p. 143 a C.—Beck. History of Inv. 2. 322.

[3] Jam. Min. 1. 251.

he calls signets (sphragides), because they sealed so well. The better sort, he says, were set, open (a jour); in such way that the gold merely embraced the margin of the stone.[1] He mentions, as though it were an unusual magnitude for this mineral, that he had seen an image of Nero in jasper, fifteen inches high. We find that this stone also, as many others already spoken of, was imitated in glass; but the counterfeit was easily detected from the difference in lustre.

Dioscorides briefly characterizes several varieties of jasper;[2] one resembling the emerald, one somewhat crystalline, resembling phlegm; one that has bright veins of white running through it; one sky-blue; one smoky; one resembling turpentine, but in what respect he does not mention; and one like the callaïs, which we have seen was of a light green color.[3] All of them, he says, were worn as amulets; and its virtue as such is mentioned by Dionysius Periegetes also, who alludes to it in three different places,[4] calling it sky-blue (σιδρόεσσαν); sea-green (for so ὑδατοέσσαν is here to be interpreted;) and green translucent (χλωρὰ διαυγάζουσαν)—The Orphic poem also styles it green (ἑαρόχροον)—The only epithets that Pliny adds to those already noticed, are, purple, and purple passing into cœrulean. Among

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[1] Funda clauduntur patentes, nec præterquam margines auro amplectente. (Plin. 37. 37.)

[2] Lib. 5. c. 160.

[3] Before page 162.

[4] Vv. 724, 782, 1120.

the localities of the mineral he mentions Chalcedon as furnishing an opaque variety.

It will be found that chalcedony and jasper, which are often associated with each other, and which are both of them, but especially the former, sometimes found united with limpid and amethystine quartz,[1] will answer tolerably well to all these descriptions of iaspis. And to this same head of iaspis it is highly probable that nephrite, and other varieties of jade, were anciently referred.

We find that Pliny again introduces here[2] as a gem, in the order in which we are now following him, the cyanus, which, under the name of cœruleum, he had before treated of as a pigment. This circumstance may be accounted for from the occasional occurrence of fine crystallized specimens of the blue carbonate of copper; which would naturally, according to his mode of speaking, be reckoned amongst gems. But it is evident that he here applies to his gem cyanus what Theophrastus says[3] of the Egyptian factitious cyanus, beforementioned.[4] The golden dust which this gem cyanus sometimes contained, was probably pyritous copper.

The sapphire of the ancients, described by Theophrastus as sprinkled with gold (χρυσιπάστος),[5] and in which Pliny says gold sparkles (scintillat),[6] is

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[1] Cleav. Min. p. 248.
[2] H. N. 37, 38.
[3] De Lapid. c. 98.
[4] Before page 66.
[5] De Lapid. c. 43.
[6] H. N. 33. 21.—Dionysius Periegetes also fixes upon this same

agreed by all to have been our lapis lazuli.[1] The name is Hebrew, and occurs repeatedly in the Old Testament, applied to the same substance.[2] What the ancients mistook for gold was the iron pyrites often disseminated in this mineral, and forming a feature in its external character, upon which, under their mistake, they were inclined to lay much stress. It is evident, however, that other minerals besides lapis lazuli were included under the name sapphire. Pliny speaks of purple sapphires, of which the best, he says, are the Median.[3]

In the case of this mineral, as of the last-mentioned, cyanus, the distinction of male and female was adopted; those of an azure color being considered males.

Pliny, it is true, says that sapphires nowhere occurred translucent; we might otherwise suppose that the oriental sapphire, wherever known, was included under the name; as also blue quartz, and blue fluor spar; which are now sometimes called by jewellers false sapphire. There are in collec-

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character, and speaks of rocks in India which contain a beautiful vein of golden and azure sapphire (v. 1105)—

Χρυσείης κυανῆς τε καλὴν πλάκα σαπφείροιο.

[1] Jam. Min. 1. 341.—Beck. Hist. of Inv. 2. 322.

[2] Ibid. 2. 324.

[3] H. N. 37, 39. Whatever the purple sapphire may have been, it was at a later period more highly valued than the azure stone. Epiphanius observes that there were many kinds of sapphire, and that the one called royal, (βασιλικὸς) spotted with gold (χρυσόστιγης), was less admired than that altogether purple (διόλου πορφυρίζων), which occurred in India. (De 12 gemmis p. 227.)

tions many engraved specimens of lapis lazuli, regarded as antiques.[1]

The first rank among purple, or violet colored gems, is assigned by Pliny to the Indian amethyst,[2] which may, possibly, have been the violet colored sapphire, or oriental amethyst. Those which he describes as easily engraved (scalpturis faciles) may have been the violet colored fluor spar, now called false amethyst;[3] and the variety of quartz which is now commonly styled amethyst, is well described by him as that fifth kind, which approaches crystal; the purple vanishing and fading into white, (ad viciniam crystalli descendit albicante purpuræ defectu.) Some mineralogists think the amethyst of the ancients to have been what we call garnet, but there seems little in its description resembling the garnet, except that one kind of it approached the hyacinth in color, as Pliny and Epiphanius[4] observe; that is, had a very strong shade of red; and so sometimes has our amethyst. The way in which it is characterized by Dionysius Periegetes, as in a slight degree purple,[5] suits perfectly with our amethyst, but in no respect with garnet. And we see our amethyst plainly indicated in one of the reasons assigned by Pliny for

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[1] Beck. Hist. of Inv. 3, 322. [2] H. N. 37, 40.

[3] The ancients, however, very frequently engraved upon amethystine quartz; and there are, in the Royal Library at Paris, many fine engraved gems of this mineral. (Jam. Min. 1. 148.)

[4] De 12 Gemmis, p. 229.

[5] "Καὶ γλυκερὴν ἀμέθυστον ἐπηρέμα πορφυρίουσαν" v. 1122.

its name,[1]—that it does not reach the color of wine, but first fades into violet. He afterwards suggests another, which is the more common derivation; saying that the Magi falsely assured that these gems were preservative against intoxication, whence their name.

The Indian amethysts are described as possessing "absolutum felicis purpuræ colorem;" and the artists, who imitated this gem, endeavored especially to produce this tint. Theophrastus twice mentions the amethyst (αμέθυστον),[2] but not in such a way as to determine it; classing it in one place with crystal, as diaphanous, and afterwards observing that it is wine-colored (οἰνωπὸν τῇ χρόᾳ).

The ancient hyacinth is thought by Saumaise to have been our ruby, which the Persians and Arabians still call *yacut;* a name derived from ὑάκινθος, hyacinth. This name may, however, have been used with as little discrimination as that of ruby is at present, to designate several very different minerals; and among them may be some that are still called hyacinth; as several varieties of zircon, and the hyacinth of Compostella, a red ferruginous quartz. Jameson enumerates seven different minerals besides zircon, to which the name hyacinth has been applied; and he appears to think that the ancient hyacinth was either amethyst or sapphire. All that Pliny says about this

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[1] Αμέθυστος from *a* and μέθυ.

[2] De Lapid. cc. 54, 57.

gem, from which any aid towards determining it can be derived, amounts to this, that it was related to, but differed greatly from the amethyst; in that, the lustre and brilliant violet of the amethyst were much fainter and feebler in the hyacinth:[1] which certainly does not well agree with the idea of hyacinth being our ruby; but favors rather, the opinion before noticed, that the hyacinth of Pliny was our amethyst, and the ancient amethyst our garnet.

The chrysolithus of Pliny[2] was, as Werner thinks, the stone which we call topaz. But the ancient name appears to have been applied somewhat loosely, as the modern is, to a great variety of minerals. The chrysolites obtained from Æthiopia were, "aureo fulgore translucentes;" but to these were preferred the Indian, which may have been the yellow sapphire or oriental topaz. The best were set open (à jour.)[3] Underneath others a foil of brass was laid. These were called chryselectri whose color approached to that of amber (electrum.) Those of Pontus might be distinguished by their lightness. They were, perhaps, yellow quartz, the Bohemian topaz; or yellow fluor spar, the false topaz; whose specific gravities are to that of the oriental topaz, as three and four respectively to five.

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[1] "Ille emicans in amethysto fulgor violaceus dilutus est in hyacintho.

[2] Plin. 37, 42.

[3] "Funda includuntur perspicuæ."

The chrysolite obtained in Spain, from the same locality with rock-crystal, we may suppose was yellow quartz. Such as had a white vein running through them, called leucochrysi, were probably agate; yellow quartz with a vein of chalcedony; and the capniæ,[1] we may translate smoke topaz. Some resembled glass of a bright saffron color; and those made of glass could not be distinguished by the sight, but might be detected by the touch, (of the tongue no doubt,) as being warmer.[2] Other varieties were melichrysos and xanthus, both from India: the former a hard brittle translucent gem, of a bright golden or honey-yellow color.[3] The latter, a very common gem in India, and afterwards described as of a whitish yellow.[4]

The asteria of Pliny,[5] is that variety of opal called girasole, from its reflecting a reddish light when turned towards the sun. Pliny describes with peculiar felicity of language the manner of this reflection.[6] This gem came from India and from Carmania, those of the latter country being preferred. Pliny describes it as difficult to engrave; the difficulty arising probably not from its

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[1] A name derived from καπνός smoke.

[2] Tactus deprehendit, tepidior in vitreis. (Plin. 37. 44.)

[3] Veluti per aurum sincero melle translucens.

[4] E fulvo candicans. [5] H. N. 37, 47.

[6] Inclusam lucem pupillæ modo quandam continet, ac transfundit cum inclinatione, velut intus ambulantem ex alio atque alio loco reddens, eademque contraria Soli regerens candicantes radios, unde nomen invenit.

hardness; but from the numerous minute fissures which traverse opal in all directions, and to which it is supposed to owe the playful variation of its colors.

The gem called astrios by Pliny,[1] which occurred in India, and on the shores of Pallene, but best in Carmania; and which "nearly related to crystal, shines from a point within it like a star, with the brightness of the full moon,"[2] we might, but for the extreme rarity of that stone, conjecture to have been asteriated sapphire. Some crystals of quartz, which exhibit irised colors, and reflections of light from their interior, might answer to Pliny's description tolerably well; but far the most probable conjecture, as regards this stone at least, is that of Werner; who supposes the moonstone of Ceylon, a variety of adularia, to be the ὑαλοειδὴς[3] of Theophrastus, the asteria, the astrios, and the androdamas of Pliny.[4] Dionysius Periegetes, when speaking of Pallene, one of Pliny's localities for this gem, says, "there is produced the beautiful stone asterius shining like a star."[5]

The astroites[6] does not seem to be determined, though Cardan speaks of it as of something

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[1] H. N. 37, 48.

[2] Intus a centro scu stella lucet fulgore lunæ plenæ.

[3] Of which Theophrastus says nothing more than that it both reflects and transmits light. (De Lapid. c. 54.)

[4] Jam. Min. 1. 362. [5] V. 327.

[6] Plin. 37, 49. Saumaise would read this name, astriotes. (Exer. Plin. p. 533, b. E.)

nown.[1] We might, perhaps, be justified in supposing it to have been an organic fossil; the asteria, or stella marina; or, since that is a very rare fossil,[2] perhaps a madreporite.

Of the astrobolos, Pliny merely says,[3] that it resembled the eyes of a fish, and had in the sunshine a white lustre. These characters would agree well with apophyllite, called fischaugenstein, by Werner; ichthyophthalme and ichthyophthalmite by other mineralogists, from the resemblance of its peculiar pearly lustre to that of the eyes of fish. But astrobolos is more likely to have been that variety of adularia, called fish's eye.

The ceraunia, which Pliny now[4] considers separately, appears to be the same mineral he has just before mentioned as a variety of what he calls astrios. The description he gives of it would, as far as it goes, be a very good one of a transparent crystal of adularia exhibiting, as such a crystal sometimes does, a blueish white reflexion, from a moveable spot in its interior. This serves to confirm Werner's conjecture that astrios was the variety of adularia which is called moon-stone.

Those other two kinds of ceraunia; the one black, the other reddish; and in shape resembling axes; seem to have been something wholly different from the one just mentioned. They

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[1] See Dalecamp. on Plin. 37, 49.
[2] See Park. Org. Rem. v. 3. p. 1.
[3] H. N. 37, 50.
[4] H. N. 37, 51.

were, perhaps, varieties of jasper, or of the axe-stone.[1]

That fourth kind, which was found only where lightning had fallen, would seem to have been an aërolite.[2]

Some varieties of the ceraunia, however, were so called from a superstitious belief that they were a protection, to those who carried them about their persons, against the effects of lightning.[3] And even to the aërolite, which was called ceraunius, as Marbodæus asserts,[4] because it was thought to be found in those places only, which had been struck by the thunderbolt (κεραυνὸς), this same virtue is ascribed.[5]

The iris[6] seems to have been a very limpid, prismatic crystal of quartz, which received its appellation from its casting upon the walls of the chamber the colors of the rainbow when exposed

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[1] See Cleav. Min. pp. 269, 340.

[2] Ventorum rabie cum turbidus æstuat aër,
Cum tonat horrendum, cum fulgurat igneus æther,
Nubibus elisus, cœlo cadit ille lapillus,
Cujus apud Græcos extat de fulmine nomen.
MARB. CARM. DE GEMMIS, § 30.

[3] Salm. Plin. Exer. p. 179, a. B.

[4] Illis quippe locis, quos constat fulmine tactos,
Iste lapis tantum reperiri posse putatur.
IBID.

[5] Qui caste gerit hunc a fulmine non ferietur;
Nec domus aut villæ, quibus affuerit lapis ille.
IBID.

[6] Plin. 37, 52.

to the sun's rays. Brongniart supposed the iridescent varieties of rock crystal to be the iris; but Pliny speaks of the colors, not as seen in the gem itself, but as reflected from the walls of the chamber.

The zeros,[1] which resembled in appearance the iris, but did not in like manner exhibit the prismatic colors, may have owed that difference merely to the imperfection noticed by Pliny; a speckled vein that ran across the crystal.

We come now[2] to Pliny's alphabetical, and other concluding lists of minerals; as to the greater part of which we should in vain seek to determine what they were. In very many cases the Greek name, with Pliny's Latin interpretation of it, is the only trace left to guide our investigation; and we are as far from knowing what the minerals so designated were, as Theophrastus, if recalled to life, received in a modern cabinet, and presented with its catalogue, would be from recognising idocrase and harmotome merely from their names; although he might perceive that these names indicated certain characters or properties of the substances to which they are applied.

As to some of the minerals alphabetically arranged, there is no doubt that they were organic fossils. Such was Hammonis cornu, "reckoned among the most sacred gems of Egypt; of a

[1] Plin. 37, 53.

[2] Plin. 37, 54.

golden color, and in shape resembling a ram's horn."[1] And such appear to have been balanites, belus, and tecolithus;[2] bucardia; encardia, of which three varieties are specified; enorchis; euneos, resembling the kernel of an olive, striated like a shell, and not very white; idaei dactyli, of an iron color, and resembling the human thumb; meconites; nympharena, like the teeth of the hippopotamus; ostracias, or ostracites,[3] so called from its resemblance to oysters (ostrea); phœnicitis; phycitis; and syringitis.

The fossil ivory that Theophrastus speaks of,[4] and the bony stones, and bones produced in the earth, which Pliny[5] cites him as mentioning, were, no doubt, organic remains; as also the palmati, which, Pliny in the same passage says, were found near Munda, and that as often as you broke the rock.[6] Other substances mentioned in these lists

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[1] Plin. 37, 60.

[2] These three are one and the same mineral, the lapis Iudaicus, called tecolithus from its fancied lithontriptic virtues. Dioscorides describes it (5, 155) as of a very regular shape, resembling an acorn; white, and with parallel lines traced upon its surface, as if in a turning lathe.

[3] Dioscorides, too, speaks of a stone, ostracites, resembling a shell (λίθος ὀστρακίτης, ὅμοιος ὀστράκῳ, 5, 165), which may be the same with this supposed fossil. He elsewhere (5, 84), however, calls a variety of furnace calamine, ὀστρακῖτις, and since Pliny in this alphabetical list, speaks of a cadmitis, between which and ostracitis he makes but a slight distinction, it is possible they may be all of them one and the same thing, called by different names.

[4] De Lapid. c. 65.

[5] H. N. 36, 29.

[6] For the views of ancient authors respecting organic fossils, see Park. Org. Rem. 1, 15.

of Pliny are not to be classed with minerals; as, for example, bronte, cinaedia, corallis,[1] chloritis, dracontites, gorgonia, hyænia, sauritis. Some minerals mentioned in these lists had been previously spoken of at greater length; as alabastrites, asbestos, capnitis, callaïs, coralloachates, obsidianus, chrysolithus, chrysoprasus, chalcitis, and hæmatites. Other names, again, are synonymous with those of minerals before examined; and not a few of those gems we may suspect to be, like the strange virtues and properties ascribed to them, wholly imaginary.

Here and there in the lists we recognise a mineral which still retains its ancient name, and is sufficiently well described to leave no doubt concerning it; as the heliotropium, a gem which occurred in Æthiopia, Africa, and Cyprus, of a leek-green color, with blood-red veins."[2] Its name, according to Pliny, is derived from the manner in

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[1] Corallia, described as resembling vermilion, and brought from India and Syene, was probably red coral, as was also gorgonia, so called, Pliny says (37, 59) because changed to the hardness of stone. For the ancients supposed coral to grow as a vegetable underneath the waves, and to harden into stone when removed from its native element. Wherefore Ovid says,

quo primum contigit auras
Tempore durescit, mollis fuit herba sub undis.

In the Orphic poem (v. 511, seqq.) this transformation is described at length.—See also Pliny, 32, 11.—The Carmen de Gemmis of Marbodæus begins its account of coral thus (§ 22):

Coralius lapis est, dum vivit in æquore, vimen.

[2] Plin. 37, 60.

which it reflected the solar rays when immersed in water; and from its being used as a mirror, in which to observe a solar eclipse.

But let us proceed to notice now, in Pliny's order, such other minerals in these lists as can be determined; or respecting which any probable conjecture may be formed.

The achates (agate), which stands first in order,[1] is spoken of by Theophrastus as a beautiful and rare stone, from the river Achates in Sicily, which sold at a high price;[2] but Pliny tells us that in his time it was, though once highly valued, no longer in esteem; it being then found in many places, of large size, and very diversified appearance. He specifies eight varieties, which had appropriate names, derived from their respective colors, or from some other distinctive character.

That in which jasper was associated with agate, the jasper-agate of modern mineralogists,[3] was called iaspachates. Cerachates was of a wax color; a variety little valued because of its abundance. Sardachates was composed in part of the sard or carnelian. Hæmachates, sprinkled with spots of jasper, or blood-red chalcedony, was the variety now called dotted agate. Leucachates was, as its name imports, of a whitish color. Dendrachates was our dendritic agate; a variety beautifully described in the Orphic poem under the name of

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[1] Plin. 37, 54.
[2] De Lapid. c. 58.
[3] Cleav. Min. p. 267.

ἀχάτης δενδρήεις.[1] Coralloachates was so called from some resemblance that it bore to coral. Marbodæus speaks of it as a gem containing saffron-colored veins;[2] and Pliny describes it as sprinkled like the sapphire, with spots of gold. May they not, in this case, have confounded with agate yellow fluor spar, containing, as it sometimes does, disseminated particles of iron pyrites. For, that other minerals besides agate are comprehended in this list is very certain, since the next mentioned variety, autachates,[3] is described as diffusing, when burnt, a fragrance resembling that of myrrh. It is not worth our while to consider with Pliny the medicinal virtues of this stone; but it deserves to be noted that he says physicians made small mortars of it.

Androdamas is described[4] as possessing a silvery lustre, and a cubical form like that of dice. The same name has been previously given to a variety of what Pliny calls hæmatite, which we found reason to regard as magnetic iron ore.[5]

That androdamas was described as of a black color, while this is said to have a silvery lustre (argenti nitorem,) which seems to forbid our regarding them as the same mineral. We may, nevertheless, suspect some relationship between the two, since the one now under consideration, is said by

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[1] Orph. Lith. v. 230.
[2] Marb. de Gemmis, §. 2.
[3] Or as Saumaise would read, stactachates.
[4] Plin. 37. 54.
[5] See before p. 131.

Pliny to resemble adamas; that is, probably, the magnetic oxide of iron so called.[1] All circumstances being considered, we might venture to pronounce this androdamas, magnetic pyrites; which, like the common sulphuret of iron, is sometimes found in cubes.[2] The lustre, indeed, is here said to be that of silver; but this false character, supposing it magnetic pyrites, may easily have been transferred to it from the arsenical pyrites with which it is sometimes found associated. And this latter is, perhaps, the mineral designated by the name which follows next in Pliny, *argyrodamas;* as to which it seems to have been undecided whether it was identical with, or different from androdamas. There appears to be as little about this mineral as about the ὑαλοειδὴς of Theophrastus to justify our regarding it as moon-stone.[3]

Antipathes was a name common to several plants and minerals thought to possess the virtue ascribed by the Magi to the substance here so called by Pliny,[4] and which is supposed to be black coral.

Arabica has been already mentioned as Arabus *lapis*,[5] while here it is Arabica *gemma*.[6] It is spoken of by Dioscorides also,[7] and by Galen, and was probably a fine white marble.

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[1] See before p. 144.
[2] Cleav. Min. p. 591.
[3] See before p. 172.
[4] H. N. 37, 54.
[5] Plin. 36, 41.
[6] Plin. 37, 54.
[7] Lib. 5. c. 149.

Aromatites, said by some of Pliny's commentators to have been amber, seems to have resembled in its properties the fossil copal discovered at Highgate Hill, near London.

Augites was thought by many, Pliny says, to be different from Callaïs. The inference to be drawn from this remark is, that generally it was regarded as the same with that mineral; which was probably turquoise.[1]

Amphitane, otherwise called chrysocolla, occurred in the form of a cube, and was said to possess magnetic properties; whence we might suppose it to have been magnetic pyrites in a cubic form. It may have been called chrysocolla from its supposed property of attracting gold as well as iron;[2] for it seems to have been a wholly different thing from the chrysocolla of Theophrastus and Pliny spoken of before.[3]

Aphrodisiace is supposed by Dalecamp to have been some variety of agate; but Pliny mentions a variety of amethyst called *Veneris gemma*;[4] and the only description of the gem now in question, "ex candido rufa est," as well as its name, aphrodisiace, agrees with the belief that, like the gem of Venus, it was amethyst.

Ægyptilla seems to have been a name common to several varieties of agate. It was perhaps

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[1] See before p. 161.

[2] Affirmaturque natura ejus, quæ magnetis: nisi quod trahere quoque aurum traditur. (Plin. 37, 54.)

[3] Page 62.

[4] H. N. 37, 40.

the ancient denomination of what is still called *Egyptian* pebble; a striped jasper; the quartz agathe onyx of Haüy.

Baptes[1] is thought, from its description and its name, to have been amber, dyed or stained of some other than its natural color.[2]

Beli oculus appears to have been the mineral now called cat's eye.

Bostrychites may have been amianthus.

Bucardia is thought by Dalecamp and Hardouin to have been turquoise.

Catochitis,[3] the same commentators think was either amber, or some variety of bitumen.

Cepitis was, perhaps, an agate.

Chalcophonos, of a black color, and which when struck rang with the sound of brass, was perhaps clink-stone.

Choaspitis is, by Dalecamp, upon apparently slight grounds, supposed to have been chrysoberyl.

Chrysopis is by the same critic thought to have been hyacinth; and *Eupetalos*,[4] a variety of opal.

Lepidotis,[5] which resembled the scales of fish, we might venture to call lepidolite.

Morochites,[6] described as leek colored, but its streak white—for so the words "lacte sudat" seem by commentators generally to be understood—was otherwise called moroxus; and hence has

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1 Plin. 37, 55.
2 See before p. 106.
3 Plin. 37, 56.
4 Plin. 37, 58.
5 Plin. 37, 62.
6 Plin. 37, 63.

Karsten derived his name for asparagus stone, which he calls moroxite. This morochites or moroxus we have already, when speaking of saline substances, found occasion to consider.[1]

Samothracia,[2] which was black, light, and resembling wood, may have been lignite, and

Selenites, bating the fabulous part of its description, we may regard as the same mineral still called selenite.

Pliny concludes his treatise upon gems with some general remarks ; and directions for distinguishing the true from false. The difficulty of doing which, he says, was great ; because the false stones were sometimes made from true ones of a different kind. The sardonyx, for example, by cementing three gems of as many different colors, black, white, and red.[3] We find Theophrastus, speaking of counterfeit emeralds ; and Pliny, of beryl, opal, ruby, amethyst, and other stones, so well imitated that it was not easy to distinguish true from false.

The skill of the ancients in their manufacture

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[1] See before p. 101.

[2] Plin. 37, 67.

[3] Plin. 37, 75. A similar fraud is sometimes practised now by cutting in like manner colored glass and rock-crystal ; giving to each one plain surface, and joining them by that with a colorless cement ; then setting them in such manner that the colored glass and the joint by which it is united to the limpid crystal shall be enclosed within the metal. By means of these doublets as they are called, may stones of any color be so well counterfeited, that the fraud can scarcely be detected. (See Min. des Gens du Monde, p. 135.)

of glass was such, that they not only made it of a crystalline purity;[1] shaped it by blowing; ground it in the lathe; and carved it like silver;[2] but the collection which Mr. Dodwell first formed and brought into notice at Rome, proves that they could successfully, and did commonly imitate, by means of it, almost every known marble, and every sort of precious stone.[3] Beckmann speaks[4] of two ancient gems in the Museum Victorium at Rome: a chrysolite and an emerald; factitious both of them; but perfectly well executed; perfectly transparent, and colored throughout, and free externally and internally from the smallest blemish.

We had before occasion to remark, that even at the early period of their Exodos, the children of Israel had amongst them engravers of precious stones.[5] They, of course, derived their art from Egypt; in which country, and in India, we, at a later period, find that such stones were, not only engraved, but imitated with consummate skill. From one or other of those countries Greece learnt both these arts; and they were practised in Pliny's time by his own countrymen also; though, probably, with less skill than by the Greeks. Here

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[1] Plin. 36, 67. [2] Beck. Hist. of Inv. 3. 208.

[3] Gell's Pompeii. Winckelmann asserts, that the ancients had carried the art of working glass to a perfection which we are yet far from having equalled, and he appeals to works that still remain for the proof of his assertion. (See Storia delle Arti del Disegno, Vol. I., pp. 26, 28, 29.)

[4] Hist. of Inv. 1. 199. [5] Before p. 19.

again, therefore, do we find occasion to observe the difference between the scientific knowledge of these ancients, and their ingenious art. They were fully persuaded that rock-crystal was permanent ice, and called it accordingly κρύσταλλος;[1] but knowing thus little of its nature, they could, nevertheless, not only form beautiful vases, drinking cups and other vessels of it; many of which still remain to testify their skill; but impart to it various colors;[2] and produce from it such close imitations of the emerald and other gems, that Pliny says, there was no more gainful fraud practiced; and he declines to point out the authors from whom it might be learned, but prefers rather to suggest some criteria for distinguishing the false gems from the true.[3]

One distinctive character, he remarks, is the superior weight of the true gem. Others are the uniformity of its structure, its freedom from vesicles within, and from roughness on the surface; its lustre, and its hardness. He observes, that fragments of obsidian will not scratch true gems; but that with the diamond (adamante) all of them may be engraved.[4]

Of the multitude of stones we have seen classed as gems, but a small portion was made use of by

[1] See before p. 139.

[2] Seneca, (Ep. 19.) ascribes to Democritus the discovery "quemadmodum decoctus calculus in smaragdum converteretur:" which Beckmann thinks was by coloring rock crystal. (Hist. of Inv. 1. 198.)

[3] Plin. 37, 75.

[4] Plin. 37, 76.

the engraver. These were principally carnelians, and such others of the siliceous kind as possessed the properties required for the nicest execution, without being too valuable in themselves to allow of having their weight and lustre impaired by the engraver's tool.[1]

To conclude now, it may be conceded by an admirer of the ancients, that as naturalists they are not presented to us in a very favorable light; that their acquaintance with natural science was empirical; that of an artisan rather than of the philosopher. But they could not have practised with success so many ingenious arts, unless they had known the properties of a vast number of bodies; and their ignorance in other points, where knowledge is thought indispensable to modern artists, only renders it the greater wonder that they were able to accomplish what they did. Pliny breaks into exclamations at the prodigious works achieved by man, in his search for the precious metals, in the bowels of the earth; comparing them to the labors of the giants.[2] And well he may, since he has to speak of penetrating mountains, with the means which then could be employed, to a distance of near eight thousand feet; through flint, (silicem,) and a substance which

[1] On the art of polishing and engraving precious stones, one of the curious and ingenious of all antiquity, see a learned chapter in Goguet's Origine des Loix, &c. Tom. 2. p. 111. See also Winckelmann Stor. delle Arti del Disegno, Vol. I., p. 25.—Vol. II., p. 20.

[2] Plin. 33. 21.

he describes as harder still than that to pierce. How slowly, if deprived of the aid of gunpowder, would our miners conduct such operations. But in this instance, as in many others, art and ingenuity supplied the place of tools. And one of the greatest philosophers of our own age[1] has acknowledged, that the ancients were in all pursuits which require only the native powers of the intellect, or the refinements of taste, pre-eminent; that their literature and their works of art offer models which have never been excelled; that they possessed, as if instinctively, the perception of every thing beautiful, grand, and decorous; and that as natural philosophers they failed, not, from want of genius or application, but merely because they followed a mistaken path.

[1] Sir H. Davy, Philos. of Chem. p. 4. Introd.

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1912

LECTURES

ON THE

GREEK LANGUAGE

AND

LITERATURE.

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PREFACE.

THE thought of printing these lectures (the first six of a short course read in Columbia College) was originally entertained in consequence of a difficulty alluded to in the beginning of the fourth, which made it necessary for the lecturer to aid his instruction on the subjects treated in that and the two following lectures, by written examples and illustrations exhibited before his class. But various considerations interfered to prevent this publication hitherto; and now the motive above specified has no longer, as regards the author personally, any weight; yet having observed that the more zealous among those he taught, derived advantage from these lectures, he is not without the hope that for others also, engaged in like studies, they may possess some interest.

The first, or introductory lecture is published for reasons that will be obvious to all who read it: the second, and third, not only that they may, being of a more popular character, invite readers of a different class from those for whom the last three are designed; but also to give a sort of completeness to this little work, which without them it might want.

Throughout the second lecture the author has been much indebted to Schoell's *Histoire de la Littérature Grecque Profane*, and this general acknowledgment is made because there, as elsewhere, the sources whence he draws, and the authorities on which he has relied, are seldom pointed out. He would to little purpose, have crowded his pages with a vain parade of notes, not wanted by those readers who possess the means of verifying them, and a mockery, as it were, of others, that is of far the greater number, as referring them to books, which, in this country, they would in most cases vainly seek to find. A portion of the sixth lecture is derived from "Remarks on the Pronunciation of the Greek Language," a small pamphlet published by the author seventeen years ago, and not now in print.

Col. Coll. July, 1835.

LECTURE I.

INTRODUCTORY.

ON THE STUDY OF GREEK.

ABOUT to speak of the value of Grecian Literature, considered in itself, or compared with that of modern times; and of the relative importance of classical and scientific studies; I am sensible that I undertake no easy task. The difficulty of treating worthily a subject increases together with its importance, and in proportion too as a theme has become trite from frequent handling; it will be easy, indeed, to speak concerning it, but hard to say any thing that shall be new.

Yet those who plead the cause of classical studies should not be deterred from asserting their just claims, by the apprehension of dwelling on a hackneyed topic. The undeserved neglect of these studies is no new complaint, because the

sources whence it flows, and which may easily be pointed out, have long existed. And since the same causes are, as we shall see, ever exerting a powerful influence, it is incumbent on the friends of sound learning to be equally unceasing in their endeavors to prevent the threatened disunion of Letters from Science; and that undue preference which the latter is seeking to usurp.

There are, indeed, some points of view from which this subject has been less examined, and which, belonging as they do more especially to our own country and to the state of society among ourselves, may possess for us a greater interest, as well as some share of novelty. To these features of it I shall hereafter call your notice. For the present my intention is to point out the natural connexion that subsists between science and letters, and attempt a vindication of those literary pursuits, which seem to be every where falling into comparative neglect.

And here let me premise, that, disregarding just now more accurate distinctions, I would by the term *science* be understood to mean *physical* science, or a knowledge of the material world, and of the secondary laws which govern it; and that by *letters* I intend studies which have no immediate reference to matter; such, for example, as grammar and criticism, poetry and eloquence,

civil history, the philosophy of mind, and especially the language and literature of ancient Greece; as well for that it is most perfect in its kind, as because it seems, nevertheless, at the present day to require all the support and countenance which its friends can give.

Against these "studies of inglorious ease," there has existed from the earliest time a certain prejudice, which has assumed various shapes, and animated different controversies, in successive periods of the world.

We find it amongst the ancient Greeks exciting a rivalry between *music* and *gymnastics;* under which two heads was comprehended all that belonged to a perfect education, or one in which both *mind* and *body* had received due culture—*Music* including whatever fell under the superintendence of the Muses: all the exercise and discipline of mind; *Gymnastics* training the body to activity and strength. Now we find there were among the Greeks themselves some of uncultivated minds disposed to give the *active* life an almost exclusive preference; and using nearly the same arguments that are employed in our day to decry studies of which the *practical* results are not at once perceived. That afterwards, among the Romans, a far less intellectual and polished people, Cicero should have found it necessary to

contend with a like prejudice in the minds of his countrymen against speculative studies, will, therefore, occasion no surprise. At a still later period the wide extension of monastic institutions, into which so many assuming the garb of religion, withdrew from the cares and business of the world, revived, under a somewhat different form, the ancient controversy between the active and the contemplative life; and added greatly to its interest and importance. And lastly, descending to our own age and time, we find that the advocates of *gymnastics* against *music* among the Greeks; the enemies of *philosophy* at Rome; the champions during the middle ages of the *active* against the *contemplative* life, are represented amongst us by a class of reformers actuated by a spirit of hostility to letters, and a jealous preference of studies, which have, as they allege, a closer relation to the business of life, and yield more plentiful and immediate fruits. It is under the banners of science, therefore, that they wage *their* war on letters; and this constitutes an obvious distinction between *them* and those who *anciently* attacked the province of the Muses. With these ancients the cry was—Cease from your idle, your unprofitable pursuits, and learn to defend your country in battle, to administer its affairs in time of peace, or to support it by the

labors of the field.[1] And this appeal was addressed alike to the votaries of *science* and of *letters;* for the poet and the sage were terms convertible, and poetry and science then walked hand in hand. But *now* some of the most dangerous enemies of *letters* are to be found among those who profess themselves the friends of *science;* who think literature at the utmost a mere embellishment of social life; are willing to tolerate it, as a harmless relaxation from serious pursuits; but will not allow it to *interfere with*, much less to *supersede* studies, which have, as they pretend, a more intimate connexion with the real business of mankind. These persons, therefore, holding science in just esteem, erroneously seek to advance its interests by reforming our systems of education in such manner as to *exclude*, or at the least *degrade* studies which exercise a most forcible though secret influence over the moral and intellectual character of man; developing and training the powers of his mind, and preparing it by cultivation to yield a somewhat *later*, perhaps, but a far *better*, and more *abundant* harvest.

For this advantage gained by *science* over *letters;* for the preference now so evidently accorded

[1] See the fragments of Euripides' Antiope, in which Zethus and Amphion appear as champions of their respective modes of life; the active and the contemplative.

to *scientific* when compared with *literary* studies, obvious reasons may be assigned. *Physical* science depending, as it does, for its perfection on time and experience, has been making continual advances; while *moral* science, and the arts related to it, have been comparatively stationary. Poetry and eloquence were carried by the ancient Greeks to a height of excellence, which it was not left for the moderns to transcend; but the progress of natural science has, of course, borne some proportion to the accumulation of facts; and especially since the attention of philosophers has been turned from vain hypotheses to careful observation of, and cautious reasoning upon, the phænomena of the material world.

The wonderful advances made by science, therefore, during the last half century; the unnumbered useful applications of it to the arts and purposes of life; and the consequent improvement in the condition of society, have, as was very natural, engaged the notice, and excited the admiration of mankind. The man of science, then, who used to be thought equally with the man of letters, a mere sluggard,

> "Immunisque sedens aliena ad pabula fucus,"

has now redeemed himself from a reproach, to which those whose pursuits are altogether literary still remain exposed.

That some amongst you are aware of the existence of such prejudices I am well convinced. Others, perhaps, may think I am contending against a phantom of my own creation—I would it were so—but am compelled to hear the value of studies, to which I am devoted by my profession, daily called in question—to listen to objections urged against systems of education, which ages of experience have approved—objections, which if they merit notice elsewhere, as in England, for example, whence chiefly they originate, are most unfounded here; where so little attention is even now given to the ancient classics, that much to lessen it, would be to banish them altogether from our seats of learning.

As things now stand we may, in fact, be said to retain amongst us a slight acquaintance with the *languages* rather than with the *writers* of Greece and Rome. No—it is not without reason, that the friends of letters take alarm, when they see their very citadel assailed; when they hear it seriously maintained in popular harangues, that Greece owes her celebrity, neither to poetry, nor philosophy, nor to eloquence, nor to arms; but to science only, and the mechanic arts.[1]

[1] It was so asserted in a public discourse pronounced before the Society of Mechanics, about the time at which this Lecture was first read.

Let the real friends of science beware how they second the inconsiderate zeal of such blind partisans, or do aught to hasten a catastrophe, which would involve, sooner or later, the very object of their care. For "the fate of science," it has been well observed, "is inseparable from that of letters; which as they gave it birth, so do they continue to afford it nourishment." A fact to the truth of which Sir Humphrey Davy also has borne testimony, saying, that, "Till the revival of *literature* in Europe there was no attempt at philosophical investigation in any of the *sciences;* the diffusion of letters gradually brought the opinions of men to the standard of nature and of truth."

I am asserting, then, the common cause of *science* and of *letters*, when I come forward in defence of that literature against which, chiefly, are directed the attacks to be repelled. For *science* it has nothing to apprehend, unless from the diminished attention paid to *letters*, and their consequent gradual decline. There is little need to point out its uses; and exhort to the cultivation of what recommends itself to notice in such an infinite variety of shapes. Love of ease, love of pleasure, love of gain, all conciliate esteem for that, which by the aid it affords to the mechanic arts, and in other ways, contributes so essentially to the comfort and conveniency of life.

These benefits of science the man of letters shares in common with the world at large, and moreover in his proper character may very frequently be indebted to its aid. Many passages in ancient authors might be referred to, where even learned critics, because they were mere philologists, have failed of the true meaning; passages never rightly understood until they attracted the notice of *scientific* scholars.

Without insisting, therefore, on what is too obvious to require proof; the use of science to the scholar; let us consider what advantages the man of science may, in turn, derive from letters.

And first the very *language* of science is derived from Greece and Rome; and the Zoologist, the Botanist, the Mineralist, the Chemist and others, will bear witness to the necessity of some acquaintance with the ancient tongues to a clear understanding even of the terms of art. But they should, moreover, become sensible of its still greater value, as affording them access to many rich sources of information—sources, which, in fact, deserve to be examined into far more diligently than they are. For as, in many instances, supposed inventions of modern times, or announced to the world as such, have been afterwards reclaimed as the property of the ancients, and found plainly mentioned in their works, it is pos-

sible that if these writings were more frequently and carefully studied by scientific men, important discoveries might be elicited from passages, that are overlooked by the ordinary scholar, as unintelligible or obscure. For superior as modern is in various respects to ancient art, there can be no doubt but that a multitude of curious secrets have been lost; and that there were valuable processes familiar to the ancients, which are wholly unknown to, or imperfectly applied by artificers of the present day. And, great as have been the advances made by modern science there remains perhaps much, notwithstanding, to be gathered from the volumes of the ancients. Although Hippocrates wrote three and twenty hundred years ago, physicians still cite him with respect; and to his aphorisms very few additions have been made.

The Greeks were acute observers, and whenever they conducted their enquiries in the true method of experiment, their writings, even on subjects of natural science, still maintain the highest value. Buffon and Cuvier bear testimony to the accuracy, the perspicuity and order of Aristotle's History of Animals: the former declaring that it is perhaps to this time the best work in its kind that we possess—that it appears this ancient knew the animal creation better, and under more

general views than it is known to us at the present day—that none other than a genius like his own, could have comprehended such an infinite variety of facts within such narrow compass, and treated a subject so little susceptible of precision with so much perspicuity and order—that, if science be the history of facts, his work is the most scientific abridgement that ever yet was made. Buffon admires especially the manner in which Aristotle treats his subject. Now it is not irrelevant to ask, if Aristotle would have been likely to use in so masterly a manner the materials which Alexander's liberality supplied, unless he had superadded to his *science*, varied and extensive *erudition;* unless he had been prepared for his task by philosophy, and poetry, and eloquence.

A literature which boasts such works as the learned French naturalist extols, cannot be without value even for the votaries of science. It is not as *such* however; it is not as *scientific* men; but simply as *men*, as rational and social beings that we owe the greatest debt to

> ——————— "famous Greece;
> "That source of art, and cultivated thought,"

and in proportion as the *moral* and *intellectual* character of man, is of higher value than his *scientific* attainments, in the same degree should those studies, which especially contribute to form

that character be deemed important. If man had reached the limit of his being, his ultimate destination, in this mortal life, if there were no loftier aim proposed to him than the gratification of *its* wants; than success in its groveling pursuits; then, indeed, the scale of what is termed utility would be the true standard by which to estimate the value of all studies and attainments. But let us not forget that our present brief existence is but the entrance to an immortal state; and that although we may not be required according to the letter of the precept to take no thought whatever for the morrow or its wants, we are at least reminded by it, that the necessities of this life should not form the chief object of our care. Reason, no less than religion, bids us consider our immortal soul; and, in proportion as mind is superior to matter, should be preferred that plan of study, which is best calculated to develope and improve its powers.

When the friends of literature insist upon its value, they are not to be supposed indifferent to the claims of science. It is impossible they should be so. They cannot fail to perceive, in common with all others, its great importance. But it does not need their patronage—its benefits are palpable, and recognized by all. For their *own* studies, however, it unfortunately happens, that their ef-

fects being contained chiefly in the mind, cannot so easily be pointed out, or rendered sensible to those, who require to be persuaded of their reality and worth. Their benefits can never be appreciated fully but by such as have ascertained them from their own experience.

Those who under pretence of zeal for science and the useful arts, decry ancient literature, affect to deplore especially the waste of time in acquiring the languages in which it is contained.

Now, the study of language generally, and especially of the Greek, has justly been esteemed one of the most useful exercises of the human understanding; and it is a gross, however common, error to suppose that one employed in such study is only charging his memory with words. He is cultivating, not his memory only, but all the powers of his mind; and it has been observed, that the study in question is, under certain circumstances, "the best exercise that can be invented to rouse the ambition, to quicken the apprehension, to ripen the judgment, and to establish a habit of close and diligent application, the first and greatest lesson of life."

When the education of a youth is, according to the common estimate, complete, how little, how very little does he know, in comparison with what may yet be learned! The whole amount

of his knowledge is as nothing, in comparison with the extent to which he still continues ignorant. The chief value of his education, therefore, must consist in the cultivation it bestows upon his mind. The worth of youthful studies must be rated, less by the importance of the subjects on which they are employed, than by their adaptation to their great end; which is, to strengthen the intellectual powers; and train up the mind to activity and vigor, by sound discipline, and well ordered exercise. Hence the propriety of conducting through the same preparatory course of study those intended for different pursuits in life —and hence, too, may be derived a sufficient answer to an objection often urged: that the studies in question have no relation to the intended callings of many who pursue them. For, however paradoxical the assertion may appear, yet experience will approve it to be true, that a youth, who has pursued with diligence the study of the ancient languages, though he shall, upon going forth into the world, and engaging in the active duties of life, throw aside his books, never to open them again, is so far from having *wasted* the hours spent upon them, that he could not have employed the same portion of time with equal advantage in any other way. But if the mere study of a language be in this point of view important, the

actual possession of it will appear no less so, when we consider, how much an acquaintance with *one*, facilitates the acquisition of a *second*, and a *third*; what essential aid a knowledge of the *ancient* affords to the student of *modern* tongues, as respects the utility of which there is no dispute; and that it is difficult, if indeed it be possible, to know well even our own language, otherwise than through the medium of the Latin and the Greek. But, not to dwell on these, and other like arguments; is it not enough, that Greek lays open to us, and renders accessible, the richest treasures of human wisdom; the fairest creations of the mind of man? Can we need a more persuasive motive to the study of a language than that it contains the most perfect models of poetry, of history, of eloquence? That it is the language in which Homer sang; in which Herodotus, Thucydides, and Xenophon record events they were actors in, or describe scenes they saw? In which Demosthenes roused or allayed at will the passions of his hearers? Can we be indifferent, lastly, to that language, in which are contained the sacred scriptures of the New Testament, and the most ancient and venerable version of the Old?

That in a country like our own, where few men are without some calling or employment in life, from which they derive subsistence; and to

engage in the active duties of which, they are hurried away from their youthful studies, with an impatience natural enough, perhaps, in a society circumstanced as ours is; that in such a country, the complaints elsewhere made, of the devotion to classical learning of so great a portion of the time of youth, have been renewed in even a louder tone, and have found more attentive listeners, ought not, perhaps, to excite surprise. These complaints, though founded in error, appeal to the prejudices of an age possessed with such a love of innovation, that it looks with an evil eye at systems of instruction established on the sure basis of long experience, *merely* because they are *ancient;* of an age so devoted to the pursuit of gain, that it regards with little favor what has not a tendency to promote some pecuniary end—as though there were nothing suited to advance the condition of society, or to grace and embellish life, except improvements in rail-ways; the devising new applications of steam; the opening new channels of trade; or the discovery of some new process in the arts. These complaints, I say, have their foundation in error, for they suppose, that one employed in the study of classical literature is employed upon empty sounds; is acquiring nothing that can aid him in the serious pursuits of life. But this is far from being true. And

if it were so, we might still, with truth maintain, that the object of youthful studies is not so much to *furnish*, as to *form* the mind. Classical studies, however, while they, in the most effectual manner, attain this chief end of youthful discipline, do much besides. They not only *form* the faculties, but supply the *memory* with a rich stock of information. The student spends much time in learning words, no doubt; but he cannot learn the signs without at the same time, gaining some acquaintance with the things signified. Does he not learn the history, geography, and chronology of the ancient world; the civil, military, and religious institutions; the private life, manners, and customs of the most interesting nations of the earth; as also, the wisest systems of philosophy and morals, that unassisted human reason has been able to invent? Does he not become acquainted with the most sublime and beautiful monuments of human wit and genius? And is it possible that all this should be unattended with most sensible advantage? What does experience teach us on this head? Let us use that of England; the country with which, next to our own, we are most familiar. Shakspeare alone excepted, (who, it has been well remarked, is an exception to all rules) what great poet, historian, orator, statesman, lawyer, or divine, has she pro-

duced, who was not a classical scholar? Hear the testimony which Chatham, one of the greatest of her statesmen and orators; one of those few who may be compared with the best of Greece or Rome; bears to the value of the studies we are called upon to defend. Writing to his young nephew, he expresses his joy to hear, that he has begun Homer's Iliad, and has made great progress in Virgil, and his hope that he tastes and loves particularly authors, who are not only the two greatest poets, but who contain the finest lessons for his age to imbibe: lessons of honor, courage, disinterestedness, love of truth, command of temper, gentleness of behavior, humanity, and in one word, virtue in its true signification. He exhorts his nephew to drink deep of those divine springs; and assures him that the pleasure of the draught equals the prodigious advantage of it to the heart and morals.[1] Milton teaches, both by precept and example, the great value of these studies, and prays God to recompense a father whose "exceeding great care had caused him to be diligently instructed in the tongues."[2] Locke states with his own entire approbation the opinion of La Bruyère, that languages are the

[1] Letters to Thomas Pitt (afterwards Lord Camelford,) Letter 2d.

[2] Milton's Prose Works.

proper study of our early years; that they are useful to men of all conditions, and open an entrance to the most profound, as well as to the more entertaining parts of learning. [1]

But it were idle, upon this point, to accumulate authorities. All who have written any thing "such (to adopt Milton's phrase) that men would not willingly suffer it to die," have agreed as to the important advantages attending the study of the ancient tongues.

There are some motives to this study which should have peculiar force with us. No where, perhaps, are more ample rewards proposed to eloquence than among ourselves. No where else has it conducted its possessor with greater certainty, to wealth, distinction, and the honors of the state. Now, native talent, it is true, aided by a moderate degree of cultivation, and improved by much exercise, may make a fluent, nay, perhaps, a forcible and persuasive speaker; but the truly great orator, who shall be able not only to instruct and charm his hearers; conciliate their affection; inform their minds; and influence their wills; but to pour along an impetuous flood of argument and passion, that shall rise far above mere persuasion; and by its resistless force bear away all

[1] Locke on Education, § 195.

that would oppose it: the orator, who by the vivid flashes of his eloquence shall dazzle and confound his adversary; by the ingenuity and force of his argumentation wrest to his purpose the inclinations of his hearers; by the strength and truth of his emotion, and all the combined powers of his art, rouse at pleasure or allay the passions of an assembled people, "and sway with potent speech the world;" such an orator, in fine, as was Demosthenes, never will again exist, unless he shall be formed upon the ancient models.

To us is addressed with peculiar weight another argument for classical studies, derived from the connexion which has been observed to exist between these studies, that especially of Grecian letters, and a love of liberty.

Through the writings of the Greeks, for a period of above twelve hundred years, there glows a spirit, which has seldom failed to kindle in those conversant with them, an unextinguishable love of freedom. As, then, we value the political privileges we enjoy, and would transmit them unimpaired to after time, let us cherish amongst us studies of which the acknowledged tendency is, to render men intolerant of tyranny, injustice and oppression.

In determining the mode in which these studies should be conducted, and the extent to which they

may be pursued, the peculiar circumstances of our country ought to be taken into view. We have not here, and it must be very long before we can possess the means that Europe boasts of forming critics and antiquaries. For this purpose we need her extensive collections of manuscript and printed books, of coins and pictures, of busts, statues, bass-reliefs, monumental inscriptions, and other remains of ancient art. We want her numerous society of men, whose lives are wholly devoted to science and letters; many of them amidst scenes calculated powerfully to excite the mind; surrounded by the ruins of ancient grandeur; within view of mountains, rivers, islands, seas, consecrated, from ages long gone by, in the immortal pages of Greek historians and bards.

It may however in some degree console us for the want of these advantages, that we are relieved from the obligation and necessity of using them. While we can avail ourselves of the labors of those who prepare for our use the best editions of ancient authors, we have little reason to envy them the task of decyphering inscriptions, collating manuscripts, turning over indexes. It were as reasonable to be envious of those, who toil in mines of gold for another's benefit. There should, no doubt, be editors and teachers of the classics; nor is it possible for *them* to obtain too full and

accurate an acquaintance with their authors; but for others to occupy themselves in the too often idle subtilties of verbal criticism; the barren trifling of mere grammarians; and in sifting that mass of rubbish, which laborious commentators have accumulated, would be waste of time on subjects little suited to enlarge or elevate the mind; and altogether foreign to the ends which the polite scholar proposes to himself in reading the authors of antiquity.

Nor, again, is it required that the lovers of *Grecian* letters should read *all* that is contained in the *Greek* language. Though in the ruins of time a vast number of precious writings have been lost, yet, on the other hand, some works have had the fortune to survive to us, that possess little value except in the eyes of a philologist—of others the merit is independent altogether of their style; and they may be read in our own language, if not quite as well as in the original, yet, at least, with a saving of much time.

Others, again, are esteemed for their style, no less than for their matter, and possess beauties, perhaps, that no translation could preserve; but within the compass of our own literature, may be found their equals in the same kind of excellence. Thus, lest by demanding over much we should fail of all, may we admit of various concessions

to the busy lives and want of leisure pleaded by our countrymen. In fact, the advantages which a study of the classics promises, may be attained within the limits thus narrowed, more certainly than by wandering through the almost boundless field of Grecian literature. If we desire to waken genius, to strengthen the judgment, or improve the taste, it imports us far more to consider the character of books, than their bulk or number.

The error of those who think we possess translations of even the best originals, which may supply their places, might, if our limits would permit, be easily exposed. For the present I content myself with appealing to your own experience. There is no one, who has read true poetry in any other language than his own, who will need arguments to convince him that there are bold figures of thought and diction, nice shades of meaning, and delicate beauties of an original, which no translation can attain to or convey.

As to our assumption that the Greek language contains the finest models, a conclusive proof of its justness is discovered in the fact, that whatever varieties exist, or have existed, in the taste and choice, of different, and distant ages and countries; though almost every civilized people has its own national literature, which it admires to the exclusion nearly of every other that is modern;

yet all ages and nations have ever united and still continue to agree in their admiration of the classic models of Greece and Rome. And a great critic has observed, that "when those who differ in their professions, modes of life, pursuits, ages and languages, have, one and all, the same opinion concerning the same thing, this deliberate sentence, and harmonious agreement of so many discordant minds gains a strong and indisputable credit to what is so admired."

Those, who in opposition to this consent of nations, throughout so many ages, would assert the superiority of *modern* writers, are, almost without exception, persons who should in modesty decline to offer their opinions on a matter, of which they are as ill qualified to judge, as the blind are to compare colors, or the deaf to decide upon the harmony of sounds. Those great masters of composition, in modern times, who have produced any thing that may dispute the palm with antiquity, have ever been forward to profess their admiration of, and acknowledge the debt they owed the ancients; and, while treading in the steps of the great originals of Greece and Rome, have been far from laying claim to that equality, which their zealous, but unlearned partisans would arrogate to them, in spite even of themselves.

In physical science, and in that greater perfection of many mechanic arts, which has resulted from its improvements, from accumulated experience, from application of machinery, and subdivision of labor, the moderns undoubtedly excel. We extend our view farther than the ancients because we are mounted on their shoulders; and it has been well observed, that the moderns, in comparing themselves with the ancients, put into their own scale not only what belongs to themselves, but all that the ancients left besides; and that, in this way, however small their appropriate share, they may easily cause their own side to preponderate.

And in regard to science also, the remark just now made of literary composition, will again hold true; that those who by their own great genius and acquirements, and by their intimate acquaintance with the ancients, have been best qualified to pronounce upon them, have ever been most ready to acknowledge their great deserts. Some proof of this fact has already been adduced, but I cannot refrain from citing one more name—one of the greatest in the records of modern science—that of Newton. Speaking of whom, Bishop Atterbury observes, that, modesty should teach us to mention the ancients with respect, especially when we know but imperfectly their works; that

Newton, who knew them thoroughly, held them in high respect; regarding them as men of great genius, and superior powers, who had carried their discoveries in every kind much farther than what remains to us of their writings would lead us to suppose; since there are more works of the ancients lost than are preserved; and perhaps our new discoveries are not of equal value with our ancient losses.

But, while the great claims of the moderns on the score of science are not to be denied, it is equally indisputable that in whatever depends on genius, taste and imagination, the highest praise of a modern is that of successful imitation. If we could estimate the *writings* of the ancients, as justly as we do their *architecture*, and their *statuary*, we should be more ready than we are to admit their superior claims. But this for various reasons we can never hope to do. There are thousands who would admire the Parthenon, or the Apollo of the Vatican, for one who is capable of enjoying Homer. In a temple, or a statue, in so far as it remains unimpaired by time, our eyes may behold the same beauties it possessed for those of the Greeks themselves; but the soul of harmony that once animated their literary works, is, for us, in a great measure, fled; and with it unnumbered graces that had their existence in

the living tongue. Nor is this the only reason why no *modern* however learned can look upon the *literary* works of Greece, admirable as he perceives and acknowledges them to be, with the eyes of the Greeks themselves. Before he can be capable of doing this, he must, as it were, cease to be a modern; must go back to the ancients, and domesticate himself amongst them; become intimately acquainted with their history, public and private; with their institutions, civil, military and religious; with their thoughts and sentiments; their manners and their customs. When from a great distance we view a noble edifice, we may be struck with its majestic appearance as a whole; may admire the harmony of its parts, its just proportions, its simple grandeur; but we must approach very near to discover the fineness and polish of the marble; the fluting of the columns; the graceful foliage of the capitals; the sculptured frieze. So is it with the monuments erected by the genius of Greece in the fields of poetry and eloquence. We look back upon them through a long vista of ages. To see them in all their beauty we must draw nigh to them; must place ourselves as nearly as possible where their authors stood; must examine them from every side, and study them again and again with the most diligent attention. For in proportion as

we do this, shall we become really sensible of their merit; and no longer acquiesce merely in the general sentiment, but be enabled to perceive for ourselves why it is that all ages and nations have ever, with one consent, admired these imperishable monuments of genius. For these are among those works of art "quæ decies repetita placebunt;" and which never will, perhaps, until they shall have been thus repeatedly examined—since it is worthy of remark that the finest productions of human genius in the arts; the remains of Phidias' statuary, the paintings of Raphael, the music of Handel, the poetry of Homer, and the oratory of Demosthenes; strike with less admiration at first, but, abiding the surest test of excellence, grow upon our love, and rise in our esteem, in proportion as they become familiar.

In truth this ancient literature is held in such light esteem with us, only because it obtains such slight attention. Our youth seldom advance beyond the threshold of the Muses' temple; and thus their toil, though, as was before observed, not unattended with advantage, fails of the richest part of its reward. They stop short when a few steps more would introduce them into glorious apartments, filled with accumulated stores of wit and wisdom, that would abundantly repay them for all their previous pains.

It is by *defect*, and not in *excess* that we now err. Let those then who would introduce reform, apply the remedy where it is really wanted; by improvements in the methods of instruction now in use; by devising means to render effective, and more fruitful of advantage, the portion of time even now given to classical pursuits; by exciting and sustaining the ardor of the young in a study, which is at first sufficiently repulsive of itself, but becomes completely so when they hear it decried by all around them, and discover that they are permitted rather than encouraged to engage in it, from a reluctant compliance, merely, with established modes.

LECTURE II.

GENERAL REVIEW OF

GRECIAN LITERATURE.

In a preceding lecture I endeavored to recommend classical studies to greater favor than they now enjoy, by showing the relation which they hold to physical science; and that their results, though not tangible, nor practical, (to use a favorite term) are not, therefore, less real and important; inasmuch as they concern man in his superior nature of a rational and immortal being. I labored to remove unfounded prejudices that exist against such studies; and to place them in their true light, as a fruitful source of pleasure and instruction; as laying the most solid foundation for every other part of learning; as calculated to refine our taste, strengthen our mental faculties, humanize our manners and conversation, grace and adorn all our other acquirements.

I sought to show that the value of academic studies consists less in the amount of knowledge gained, than in the cultivation bestowed upon the powers of the mind; the intellectual vigor and activity imparted by the discipline of his youth, enabling the man to explore successfully, himself, the rich mines of learning into which while under training he had been only introduced.

An eulogy of ancient literature, and labored vindication of the study of it, might appear superfluous, addressed to you; but I am aware that while some amongst you are ready to admit the claims, which you own experience convinces you are just; others, again, turn to these studies with distaste, from sense of duty only, and may either be roused to greater zeal in their pursuit of them; or, at the least, be brought to such a right mind, as to believe that what has continued, notwithstanding man's love of novelty, to be admired for above two thousand years, by the wisest and most learned amongst every polished people, must needs possess merit of a superior kind.

The present lecture will exhibit a general view of that literature, to the study of which you are invited; a survey, though hasty and imperfect, of that vast field on which we are about to enter; and upon parts of which we shall hereafter dwell for a sufficient time to examine them with more attention.

For reasons that shall by and by be stated, I confine myself to Grecian literature; the historian of which may be expected to comprehend in his wide survey, from Orpheus to the fall of Constantinople, a period of above twenty-seven hundred years.

During this long lapse of ages there occur several epochs, at which political or other causes influenced powerfully the state of letters; and these eras have been adopted variously by different authors, in their subdivision of the subject, according to their varying views of it, and the extent to which they have carried their remarks.

The principal events, or dates, that serve to subdivide this extensive period, are—the Capture of Troy—the Age of Homer—the Legislation of Solon—the Conclusion of the Persian War—the Accession of Alexander to the throne of Macedon—the Capture of Corinth, and establishment of the Roman power and influence in Greece—and the Removal of the seat of empire to Byzantium.

The period terminating with the first of these epochs has been called the *Fabulous*—that from the fall of Troy until the archonship of Solon, the *Poetical*—the next, which ends with the accession of Alexander, is denominated the *Athenian*—then succeeds the *Alexandrian* age; and from the capture of Corinth to the removal of the seat

of empire, the *Roman*—which is followed, lastly, by the *Byzantine.*

Let us consider each of these periods in order; attempting, of course, nothing more than a mere outline, or an imperfect sketch, partially filled up in parts of peculiar interest or importance.

The period antecedent to the Trojan war, and to the times which Homer's narrative embraces, has been styled the *Fabulous*, because we cannot through the dark mists of antiquity that envelope it, distinguish truth from falsehood, history from fable. Tradition, however, preserved to the Greeks of after time the *names* of great poets who lived during this dark age of fable, and even the works of several; as of Olen, the Hyperborean; of Thamyris; of Orpheus; and of Musæus—all Thracians, for from Thrace we find the Greeks deriving, not only their earliest poetry, but their more incorrupt religion also, and purer modes of worship, adulterated afterwards by admixture of Egyptian superstitions.

The first poetry of the Greeks was chiefly of a mystical or sacred character; consisting generally of hymns in honor of the gods; forms of initiation and expiation; charms against disorders; oracles; religious and moral precepts. In one and the same person were united the characters of priest, prophet, poet and musician. Between poetry and

music, indeed, there existed an almost indissoluble union; the ancient Greeks being scarcely acquainted with music merely instrumental, or with poetry destitute of the embellishment of music. To these the dance was often superadded. The hymns of Olen, for example, the first composed for the Greeks, were accompanied not only by music, but by a sacred dance. To this Olen is ascribed by a poetess, whom Pausanius cites, the invention of the hexameter, or heroic verse; in which measure his oracles are said to have been expressed.

The second of these poets, Thamyris, is described by Homer as struck with blindness by the Muses—and deprived of his powers of song, in punishment of his having presumed to rival them in skill. Plato classes his hymns with those of Orpheus; and our own Milton places him by the side of Homer; saying,

> "Those other two equall'd with me in fate,
> "So were I equall'd with them in renown,
> "Blind Thamyris and blind Mæonides."

The third name, Orpheus, is more familiar to our ears; but rather because it has been much associated with fable, than that we *know* any thing more of him than of the others. In one respect, however, he may be said to differ from the rest: in that we have a considerable volume of poetry

still remaining under his name; and of which the genuineness was never called in question till about one hundred and sixty years ago, when Huet, Bishop of Avranches, first suggested doubts as to its high antiquity. This point has since then been much discussed by learned critics; many of whom, led by traces of Christianity, discernible in these poems, as they think, regard them as the work of some Platonic Christian.

Gesner, an able scholar, who prepared an edition of them published after his death by Hamberger, was of opinion, that they are the poems of Orpheus, as reduced to writing by Onomacritus, an Athenian poet, who lived towards the close of the sixth century before the Christian era; who is described by Herodotus as an interpreter of the oracles of Musæus, and as having been banished by Hipparchus for introducing amongst them a prediction of his own. Gesner declares that after the most diligent and repeated study of the Orphic poems, he had been unable to detect in them any thing repugnant to the times in which Orpheus is said to have lived—any mention of person, place, invention, or other thing, more recent than the Trojan age—Orpheus speaks throughout in his own person; and the language is Homeric, or stamped with the same impress as that of Homer, and the most ancient oracles.

But notwithstanding this opinion of Gesner, and the credit these poems had so long enjoyed, the decision of Hermann, founded, in great measure, on a critical examination of the language, and the structure of the verse, is, that they cannot claim a higher antiquity than the fourth century after the Christian era; but in this opinion many of the ablest critics refuse to acquiesce. It rests upon no very sure foundations; and Hermann appears sometimes to obtrude into the verse the very peculiarities upon which he builds his argument.

These remains of Orpheus, if we may still venture so to call them, consist of an heroic poem of about fourteen hundred verses; in which the author, who was one of the companions of Jason, describes the voyage of the Argonauts—Eighty-six sacred hymns, prefaced by an address to Musæus—A poem on the mystical virtues of thirty different precious stones—and a number of fragments, that have been gathered out of various ancient authors.

Orpheus is described by Horace as "a sacred messenger of the gods, said to have tamed tigers, and fierce lions, because he had reclaimed man from a wild and savage life." In his Argonautica he speaks of himself as having by the powers of his lyre, caused the trees, with which the ship

Argo was constructed, to descend from the mountain tops.[1] He describes himself as contending in song with Chiron; saying, as we may translate, "Then I, the sounding lyre from him received, gave utterance to my tuneful voice; first in dark-speaking hymn of Chaos old; and of its changing forms—how Heaven its limits reached; of the creation of the wide-spread earth, and ocean's depths, and whatsoe'er most ancient, perfect, and omniscient Love brought into being and distinguished each from each."[2]

Such passages as this excited the suspicion of Huet, who fancied he could discern in them the hand of a writer acquainted with the sacred Scriptures. But we find that Apollonius of Rhodes introduces Orpheus calming an angry strife among the heroes his companions by the enchantment of his song, and celebrating the very same subjects—"For he sang how earth and heaven and sea, at first were blended in one common form; but how from this pernicious strife they were divided each from each apart."[3]

Amongst the hymns of Orpheus is one addressed to "Night;" in which she is invoked as "parent of gods and men, first source and origin

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[1] Orph. Argonaut. v. 263. [2] Ibid. v. 421.
[3] Apollon. Rhod. Argonaut. I. 496.

of all." This is mentioned merely for the purpose of calling your attention to one of those *learned* allusions so thickly scattered through the poetry of Milton; who says,

> "With *other* notes than to the Orphean lyre,
> I sung of Chaos, and eternal Night—
> Taught by the heavenly Muse to venture down
> The deep descent, and up to re-ascend."

We have seen that Chaos and eternal Night are themes celebrated by Orpheus in song, dictated, as we may suppose, by the Muse Calliope, his mother; but Milton sings of them in *other* notes, for he derives from the *heavenly* muse his inspiration.

Musæus, the disciple of Orpheus, was author of various poems, falling under some one or other of the descriptions just now given. None of these have escaped the destroying hand of time; save a few verses cited by Greek writers, as containing predictions of political events. His oracles, which seem to have formed an important portion of his works, and for interpolating which Onomacritus was banished by Hipparchus, were afterwards used of Hippias, with the aid of this same Onomacritus, to incite Xerxes to the invasion of Greece.

The graceful little poem of Hero and Leander is by Musæus, the Grammarian, as he is styled;

a writer of the fourth century, as is thought, and consequently more than sixteen hundred years later than the poet of whom we are now speaking. This remark might seem unnecessary here, but for the strange mistake, which such men even as Aldus Manutius and Julius Cæsar Scaliger were guilty of, in ascribing this comparatively modern poem to our ancient bard.

Among the pious frauds due to the ill-directed zeal of certain early Christians, are eight books of Sibyline oracles, meant to pass for the productions of an age long anterior even to that we are considering, but which, at this day, are rejected universally as spurious. The name Sibyl, which signifies according to its usual derivation an interpreter of the will of Jove, was applied, we are told, to as many as ten inspired prophetesses; the most celebrated of whom was Herophila of Cumæ; from whom were derived the oracles preserved among the archives of the Roman state. That there were among the ancients such predictions, held in great respect, and sometimes remarkably fulfilled, is not to be denied; and there are pious and judicious writers, who believe them to have been real declarations of the will of God, condescending to foreshow thus important national events. But none of those predictions are supposed to be contained in the books just mentioned,

which do not so much foretell the future, as give a narrative of past events, under the obscure veil of prophesy.

The first, for example, contains a history of the creation, the fall of Adam, and the deluge, taken evidently from the book of Genesis. Among the manuscript treasures of the Ambrosian library has been discovered by Angelo Majo, a fourteenth book of Sibyline oracles; which differs from the others in this, that it is the work of one who appears to be a stranger to the Christian faith; and contains predictions, which, whether true or false, have not, at any rate, been formed after the event. In it is foretold a destruction of Rome so total that the traveller shall be unable to discover what that city once had been; so completely shall it be buried in its ashes. The prophetess, however, goes on to describe a long line of princes under whom it shall be again restored.

More time has been spent in this domain of fable than may seem consistent with our plan, because it is one which we shall have no occasion to revisit; while through the next two divisions of our course, the *Poetic* and *Athenian* ages, we shall for the present hurry rapidly along; since Epic and Lyric poetry, which were especially cultivated in the former, and Dramatic, which formed a chief distinction of the latter age, will be made

hereafter, each of them a separate subject of consideration.

The Poetic age has been so styled not only because the poetry of Greece, of which there remain authentic monuments, then had its origin; but because the Greeks during this age were unacquainted with literary composition in any other than a poetic form. Prose was first written about the end of this period, that is, about the time of Solon's legislation, by Pherecydes of Syros, Anaximander, or Cadmus of Miletus.

Besides the Epic and the Lyric poets, whom we shall hereafter consider separately, this Poetic age gave birth to Tyrtæus and Mimnermus: elegiac poets both, but of characters widely opposite. The former, an Athenian by birth, was made a Lacedæmonian citizen, in gratitude for his having, by the influence of his verse, rekindled the warlike spirit of the people; and his battle songs were chanted by the Spartan bands as they advanced

> "In perfect phalanx to the Dorian mood
> Of flutes and soft recorders."

Mimnermus was one, who, by his own confession, found life a burthen if deprived of love and mirth. Of each of these poets we possess some few remains. Those of Tyrtæus breathe naught but patriotism, and a generous contempt of death en-

countered in our country's cause. Those of Mimnermus are in a tender and voluptuous strain: the shortness of life—the quick flight of youth and beauty—and the approach of hateful age, their constant theme. Of Archilochus, who flourished during this age, we have little left except the brightness of his fame; but it would be unpardonable to omit all notice of a writer, whom Horace speaks of, as armed with his own iambic, because he directed it in satire with such fatal force—and whom Cicero ranks with Homer, Sophocles and Pindar; as holding each the first station in his appropriate sphere.

To the conclusion of this Poetic age, and the commencement of the following, we may assign a class of moralists, called the *Sententious* poets, because they delivered in verse the precepts of experience; proverbs, maxims, and moral sentences. The chief among these writers were, Theognis, Phocylides, and Solon, the Athenian legislator, whose laws even were expressed in verse; as, indeed, in the earlier ages all laws were; their metrical form serving to impress them on the memory, and to facilitate the handing of them down from generation to generation. Hence it came to pass that the same word, νόμος, was used to signify both a law and a musical modulation.

Poetry and Music were in this age powerful engines of state policy. Lycurgus employed Thaletas, a poet of Crete, to prepare the minds of his countrymen for the reception of his laws; and Solon used the aid of Epimenides, a native of the same island, to effect the same end at Athens. This Epimenides is the poet to whom St. Paul in his Epistle to Titus has alluded, calling him "one of themselves, a prophet of their own," and citing a verse from him.[1]

"Κρῆτες ἀεὶ ψεῦσται, κακὰ θηρία, γαστέρες ἀργαί."

When in the fabulous history of these ancient times we read of walls and towers built; of forests felled; of savage men reclaimed, and of other such wonders wrought by the lyres of Orpheus and Amphion; we must understand, that these effects were produced not upon inert matter, but upon the minds of men, by the concord of sweet sounds with bland persuasive words; that the effects were due, less to the music than to the ἀναξιφόρμιγγες ὕμνοι, the hymns that *ruled* the lyre; that these hymns were chanted too, by men invested with a sacred character. For in those days poesy and wisdom were the same—poet, prophet, sage, were terms synonymous.

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[1] Tit. i. 12.

The *Athenian* age, which comes next in order, comprehends, according to the divisions we adopted, a period of about two hundred and sixty years; from Solon's legislation, five hundred and ninety-five years before our era, to the accession of Alexander. It is the latter half of this period, however, or that part of it which followed the conclusion of the Persian war, that deserves especially to be called the Athenian age.

We shall find a suitable occasion hereafter to consider this interesting portion of our subject; and must for the present content ourselves with a mere passing notice. It might at first view seem possible to examine this so brief period in at least the cursory, and superficial manner hitherto adopted; but, to be convinced of the contrary, we need only call to mind the names of those, who by the splendor of their genius now illumined the walks of history, the drama, philosophy, eloquence and art; shedding over the whole of this period such a blaze of intellectual light, that, not confined to Athens, nor that age, it has beamed through all succeeding times, and still fixes our admiring gaze. Into the causes of this phænomenon we will inquire hereafter; that it is one which may well excite our wonder, will be evident if we consider, that besides the many others whose works are wholly lost to us, there flourished during this

brief period of one hundred and fifty years, such dramatists as Æschylus, Sophocles, Euripides and Aristophanes—the historians Herodotus, Thucydides and Xenophon—the father of medicine, Hippocrates; the Great, the Divine, as he was styled—in oratory, Lysias, Isocrates, Isæus, Æschines, Demosthenes—in philosophy, Plato and Aristotle, not to mention Socrates, the great teacher and master of them all; nor the many others, who, though distinguished for the arts of war or peace, do not now properly come under our consideration; as Themistocles, Aristides and Cimon—Pericles, Alcibiades and Phocion—Phidias, Myro and Praxiteles—Panænus, Apollodorus, Polygnotus—Parrhasius, Zeuxis and Apelles. By all these and many more besides, was this period illustrated, and they were all, with two or three exceptions, either native citizens of Athens, or dwelt and flourished there.

The age that next succeeds is styled the *Alexandrian*, because Grecian letters, which had become well nigh extinct during the wars that followed upon Alexander's death, revived again at Alexandria, under the liberal patronage of the first three Ptolemies; and their seat of government became the metropolis of science, and the instructress, as Athenæus tells us, of Greeks no less than of barbarians.

It is true, however, that with the diffusion of Grecian letters, in consequence of Macedonian conquests, their evident decline began. And although there resulted many good effects from the dispersion of them, first toward the East by the victorious arms of Alexander, and afterwards into the West, when

> "Græcia capta ferum victorem cepit, et artes
> "Intulit agresti Latio."

Though the seeds of learning and the arts, confined before within the narrower bounds of Greece proper and her colonies, came thus to be widely disseminated, yet Grecian literature, from this time, lost in a great measure that stamp of originality, which had heretofore constituted its peculiar excellence. The New Comedy, Pastoral, and some other kinds of poetry were now cultivated, it is true, with great success, and writers of every kind so abounded as to leave nothing to be desired, if numbers could compensate the want of that supreme eminence we have hitherto contemplated. There may still be named, no doubt, a long series of authors in almost every department of literature, who are, as they deserve to be, much esteemed; but the utmost that can be granted to any writer of this period is that faultless mediocrity ascribed by Longinus to two amongst them, Theocritus and Apollonius of Rhodes.

The true, bold, lofty, and original conceptions, the chaste simplicity, unaffected grace, or nervous energy of style, that distinguished the Golden times of Grecian poesy, give place, in this tinsel age, to studied imitation, or far fetched conceits; to affectation, false refinement, and vain display of erudition.

The science of philology began now to be cultivated, and the works of the ancients furnished subject inexhaustible for commentaries, explanations, illustrations. But in proportion as men reasoned, letters and taste decayed. Learning supplanted genius; art banished nature; critics prescribed bounds to imagination, beyond which it should not be allowed to range. It must be understood, however, that this character belongs not to all individuals; but to an age, as compared with the heroic age of Grecian letters. There were still, highly gifted men, whose works will be read and admired together with the productions of those happier preceding times; yet they were mere men; fair, well-proportioned, graceful, and accomplished, it may be; but of ordinary stature. There were now no longer giants upon the earth.

At the very commencement, indeed, of this Alexandrian age the language and literature of Greece may be regarded, as yet in their vigor; for it was after the accession of Alexander, that

Athens witnessed the most splendid exhibition of the powers of Demosthenes, in that famous oration for the crown, which was decisive of the protracted contest between himself and Æschines. But from this period the Greek language suffered so evident a decline, that some more scrupulous grammarians will not cite, as illustrative of its usage, examples drawn from writers subsequent to Alexander's reign. During the Athenian age we saw the literature of Greece concentered in the city of Athens; while in the times antecedent to that period there were many cities of Greece proper, or her colonies, that might dispute the palm with each other, and claim precedence of the city of Minerva. And now again in this Alexandrian age, we see writers no longer confined to Athens, nor even to her Egyptian rival, nor to any other spot, but springing up in every part of the widely extended dominions of the successors of Alexander. The city of the Ptolemies, however, possessed great advantages in its favorable site; its extensive commerce and great wealth; its exclusive possession of papyrus, and of skill to form it into a substance better fitted for the purpose to which it was applied, than any that had yet been known. These circumstances, together with the munificence of its first princes, who were zealous and enlightened patrons of the arts; and

lastly, and especially, the establishment of the Museum and of its Library, made Alexandria for a long time the center of refinement, and the chief resort of literary and scientific men. But about the middle of the period we are now considering, there arose in Mysia, a province of Asia Minor, a formidable rival of the Alexandrian school.

Eumenes, second of that name, king of Pergamus, founded in his capital a library that soon excited the jealousy of the Ptolemies; which showed itself in a decree prohibiting the exportation of papyrus. The kings of Pergamus were obliged, therefore, to substitute what, from their use of it, or from some improvement now introduced in the mode of preparing it at Pergamus, was called περγαμηνὴ, charta pergamena, parchment; which is incorrectly said to have been first invented at this time, for the same substance is mentioned under a different name, by Herodotus and Ctesias, writers of more ancient date.

To the court of Pergamus now, the learned were, by the liberality of its princes, attracted from every quarter; and its school might have vied with that of Alexandria, but for the check it received from the bequest by Attalus of his kingdom to the Romans. After this transfer [redacted] but languish feebly, until Mark Anthony

a death blow, by removing thence the noble collection of two hundred thousand volumes, left by Attalus, and transporting them to Alexandria, to increase the library established there, in the famed temple of Serapis.

Another rival of Alexandria rose, at a somewhat later period, in Tarsus, a city of Cilicia; the birth-place of St. Paul, who styles himself "a citizen of no mean city;" and a Greek editor of his writings, Euthalius, speaks of him as dwelling "in the *eye* of Cilicia, in the city Tarsus." Strabo describes this city as "populous and very powerful; so devoted to the study of philosophy, and the whole circle of sciences, as to have surpassed even Athens, Alexandria, or any other place that might be named."

An invention of this erudite age, to which we shall by and by have occasion to refer, was the canon of classical authors, as it has been called, which was arranged by Aristophanes of Byzantium, curator of the Alexandrian library in the reign of Ptolemy Euergetes; and his celebrated disciple Aristarchus.

The daily increasing multitude of books in every kind, had now become so great, that there was no expression, however faulty, for which precedent might not be found; and, as there were far more bad than good writers, the authority and

weight of numbers was likely to prevail; and the language, consequently, to grow more and more corrupt. It was thought necessary, therefore, to draw a line between those classic writers, to whose authority an appeal in matter of language might be made, and the common herd of inferior authors. In the most cultivated *modern* tongues it seems to have been found expedient to erect some such barrier against the inroads of corruption; and to this preservative caution we are indebted for the vocabulary of the Academicians della Crusca, and the list of authors therein cited as affording *testi di lingua*. To this we owe the dictionaries of the Royal Academies of France and Spain, of their respective languages; and Johnson's Dictionary of our own. But as for the example first set in this matter by the Alexandrian critics; its effects upon their own literature have been of a doubtful nature. In so far as the canon has contributed to preserve to us some of the best authors included in it, we cannot but rejoice. On the other hand, there is reason to believe that the comparative neglect into which those not received into it were sure to fall, has been the occasion of the loss of a vast number of writers, who would have been, if not for their language yet for their matter, very precious; and who, perhaps, in many cases, were not easily to

be distinguished, even on the score of style, from those that were preferred. We might instance Cleanthes, who, to judge from a single hymn that is preserved, was one of the noblest poets of any age or country. Though he is said to have written much besides this hymn, and though his death happened eighty years before that of Aristarchus, yet his name is not found in the canon settled by that critic. A canon which I proceed to state, as it will hereafter be referred to, and will serve to class many well known names.

The Epic poets contained in it were Homer, Hesiod, Pisander, Panyasis, Antimachus.

The Iambic poets, Archilochus, Simonides and Hipponax.

The Lyric poets, Alcman, Alcæus, Sappho, Stesichorus, Pindar, Bacchylides, Ibycus, Anacreon, Simonides.

The Elegiac poets, Callinus, Mimnermus, Philetas, Callimachus.

The Tragic poets, Æschylus, Sophocles, Euripides, Ion, Achæus, Agatho, of the first class—Alexander the Ætolian, Philiscus of Corcyra, Sositheus, Homer the Younger, Æantides, Sosiphanes and Lycophron, formed the second class, or the Tragic Pleiades, as they were called.

The poets of the Old Comedy were Epicharmus, Cratinus, Eupolis, Aristophanes, Pherecrates and

Plato—of the Middle, Antiphanes and Alexis—of the New, Menander, Philippides, Diphilus, Philemon and Apollodorus.

The Historians were Herodotus, Thucydides, Xenophon, Theopompus, Ephorus, Philistus, Anaximenes and Callisthenes.

The Orators, Antiphon, Andocides, Lysias, Isocrates, Isæus, Æschines, Lycurgus, Demosthenes, Hyperides and Dinarchus.

The Philosophers, Plato, Xenophon, Æschines the Socratic, Aristotle and Theophrastus.

The Poetic Pleiades, as they were styled, because they were about coeval, during this Alexandrian age, were Apollonius Rhodius, Aratus, Philiscus, Homer the Younger, Lycophron, Nicander and Theocritus.

Of the seventy-five authors included in this list there are but twenty-five of whom we now possess any remains that deserve mention. Besides the Tragic and Poetic Pleiades, the only authors named in it belonging to this Alexandrian age, are the Elegiac poets Philetas and Callimachus; the writers of New Comedy; the historians Anaximenes and Callisthenes; the orators Hyperides and Dinarchus; and the philosopher Theophrastus.

The distinction between Old, Middle and New Comedy, we shall hereafter find a more fit occa-

sion to consider. The New was confined wholly to this age; and the ancients cite the names of no less than thirty-two authors of it; but the works of no one of them have reached us. The most celebrated of them all, Menander, wrote, we are told, eighty comedies; of which we can obtain but an imperfect idea from any imitations of them that remain. The few fragments we possess, are such as to excite regret for the loss of one, whom Plutarch, Dion Chrysostom, Ovid, and others speak of with the highest admiration, as preferable to all that the Old, or the Middle Comedy had produced most perfect. "I am of opinion," says Quinctilian, "that he alone, being diligently read, may supply the place of all the precepts that we give; so perfect an image of life does he place before us; such fertility of invention, such powers of eloquence does he display; so suited to all occasions, all emotions does he seem." We may judge of the esteem in which the Romans held this poet, from the fact of their considering Terence, greatly as they admired him, far inferior to his model. I say, his model, for of the six plays of Terence, four are imitations of Menander. This preference of the Greek poet is expressed in some verses of Julius Cæsar's that remain; in which, though commending Terence, he calls him "dimidiatus Menander," a halved Menander;

and regrets his want of the comic force of his original.

Of Pastoral verse, which, if we deny the claim of the fabulous Daphnis, may be said to have had, in this age, its origin, the chief writer is Theocritus. This poet spent his life partly at the court of Ptolemy Philadelphus, and partly in Sicily, during the reign of Hiero II., king of Syracuse. Of the thirty Idyls, which, besides epigrams and other pieces, are usually published as his, ten only are of a pastoral character. These describe in the dialect of Sicilian shepherds their manners, their sentiments, and the scenery of their country. Theocritus has not, like other pastoral poets, painted an ideal state of society, but the real life of those amongst whom he was conversant, in an island thought to retain many traces of the primitive simplicity and happiness of the golden age. He is considered as having attained the perfection of this kind of verse; excelling in nature, simplicity, variety, and grace, as much as some of his imitators do in art, refinement and delicacy of taste. The pastorals of Virgil, however, have found more imitators than those of Theocritus, because it is easier to copy art than to seize and appropriate the native graces of an original. The pastorals of Theocritus have been compared to an extensive fertile mead, watered by fresh

rivulets, abounding in fair variety of herbs and fruits and flowers; those of Virgil, to a garden, divided into shining borders and parterres; filled with various flowers transplanted into it from their natural meadows; but skilfully arranged, watered and cultivated with the utmost care.

Besides comedy, and pastoral, this age produced lyric and elegiac—didactic, epic and epigrammatic poetry. Callimachus, who flourished at the court of Ptolemy Philadelphus, is by some ancient critics ranked first among the elegiac poets; but from the language used by Horace it may be inferred that he gave the preference to Mimnermus. Of a great variety of poems written by Callimachus, the chief remains are six hymns, and about eighty epigrams; esteemed among the best that have been transmitted to us. His poetry is thought to display more of learning than of genius; and since this erudition may have been more suitably displayed in his prose compositions, which were numerous, the loss of them is justly a subject of regret.

Of the didactic poetry, for which, as suiting with its learned character, this age was celebrated, there are several specimens remaining. The chief among them is the Phænomena of Aratus, an astronomical poem; on which Quinctilian passes an unfavorable judgment; but which Cicero ad-

mired, and translated into Latin verse; as Germanicus Cæsar likewise did; and after him, Avienus. This is the poem from which St. Paul, whose countryman Aratus was, cites, when arraigned before the Areopagus, the words "τοῦ γὰρ καὶ γένος ἐσμέν," "for we are his offspring." Through the whole of this passage, Acts xvii. 28, it is evident that the Apostle had in view the first five verses of the "*Phænomena.*"

One of the most extraordinary productions of this age, is the *Alexandra* or *Cassandra* of Lycophron, a poem classed by the ancients under the head of *tragic*, by modern critics under that of *lyric* verse.

The whole poem is comprised in fourteen hundred and seventy iambic verses; but has furnished subject for many volumes of notes, commentaries and dissertations; intended to throw light upon a composition proverbially called τὸ σκοτεινὸν, or *the dark.* Worthless as a poem, it is of great value to the antiquary; because the princess Cassandra while foretelling the overthrow of Ilium, and the misfortunes that await the actors in the Trojan war, never expressly names those of whom she speaks; but describes them by periphrases, alluding generally to some obscure fable, or historic fact; and takes occasion to connect together every thing that tradition or mythology supplies of

strange and wonderful, in the story of every one she mentions. This has rendered the poem an exhaustless mine of erudition; but one, which, without the aid of Lycophron's contemporaries, whose voluminous commentaries have been preserved to us in part by Tzetzes, a writer of the twelfth century, we should in vain, at this day, endeavor to explore.

The only epic poet of this age whose work remains is Apollonius, a native of Alexandria; but styled Rhodius, because, in consequence of a dispute with the poet Callimachus, his teacher, he removed to Rhodes, and there obtained the freedom of the city. He afterwards returned to his native country, and as superintendant of the library succeeded Eratosthenes, whom old age and infirmity obliged to resign that charge. The principal work of Apollonius, and the only one that has survived to us, is an epic poem in four cantos, entitled *Argonautica;* in which are described the voyage of Jason and his comrades to Colchis; his conquest of the Golden Fleece; and the return of the heroes, after long and dangerous wanderings, to Pagasæ, the place of their departure. The plan of the work is simple, suited rather to an historic relation than to an epic poem; but it abounds in pleasing narrative and description, is remarkable for purity of language and harmony

of verse; and has on many occasions, and especially throughout the fourth book of the Æneid, afforded even to Virgil, a model for his imitation.

Among about thirty authors of epigrams or other shorter pieces, who flourished during this age; and of whose works any portion has survived, there is no one better entitled to a separate notice than Cleanthes; an eminent stoic philosopher, successor to Zeno and master of Chrysippus. There remains of him that single hymn to Jupiter, already mentioned, which Bishop Lowth commends in the highest terms; pronouncing it to be "an exceeding fair monument of ancient wisdom."

Although, from the necessity of confining myself within reasonable bounds, I decline to speak of other than poetic writers, yet this age was so remarkable for science, that it would be inexcusable to pass that fact altogether without notice. We moderns are ready to acknowledge that the ancients were poets, historians and orators; that they excelled in sculpture, architecture and such arts; while we refuse to them, commonly, the praise of science. But to remind the mathematician of the great debt he owes the Alexandrian age, even upon this latter score, we need only name such geometers as Euclid, Apollonius of Perga, and Eratosthenes—such a mechanician as

Rich in history and philosophy, this age was exceeding poor in poetry and eloquence. The preservation of so many of its authors is to be ascribed to the multiplication of copies, as letters were more widely diffused: and to the diligence with which, as we have seen, new libraries were formed at Rome, and those of Alexandria again restored by Mark Anthony, and by the emperor Claudius. This latter city, indeed, having recovered from a temporary depression, became again, and continued for several centuries after the Christian era to be the chief seat of science and letters in the world; boasting such divines as Clement, Origen, Athanasius and Cyril—such mathematicians as Diophantus, Pappus, Theon, Proclus and others; among whom should be named Hypatia, a lady as remarkable for her beauty and her virtues, as for her science: which was such that she arranged astronomical tables, and illustrated with commentaries the Conic Sections of Apollonius, and the Algebra of Diophantus.

The last division of our subject, the *Byzantine* age, extends from A. D. 325 to 1453 of our era, a period of one thousand one hundred and twenty-five years. Though this long night of ages produced a multitude of authors whose wor still remain, they are not such, as o occasion should engage our not

Roman age, was the imitation, first by munificent individuals, and afterwards by Augustus and his successors, of an example, which the first Ptolemies had set; of forming public libraries. These became in course of time so numerous, that, besides many private collections of great extent and value, there were in Rome twenty open to the public, and furnished at the emperor's expense, with all that could be required by such as had occasion to consult them.

To this Roman age, which embraces a period of about five centuries, there belong a great number of valuable writers. The chief among them, whose works have in whole or in part descended to us, are the historians, Polybius, Diodorus Siculus, Dionysius of Halicarnassus, Philo Judæus, Josephus, Arrian, Dion Cassius, Herodian, Plutarch, Appian, Polyænus, Diogenes Laertius, Ælian, Philostratus—the geographers, Strabo, Dionysius, Ptolemy and Pausanias—the philosophers, Epictetus, Lucian, Marcus Aurelius Antoninus, Maximus of Tyre, Plotinus, Porphyry and others—the physicians, Dioscorides and Galen—the poets, Nicander and Oppian—the orators, Dion Chrysostom and Aristides—the mythographers, Apollodorus and Antoninus Liberalis—the grammarians and rhetoricians, Athenæus, Hermogenes and Longinus.

Rich in history and philosophy, this age was exceeding poor in poetry and eloquence. The preservation of so many of its authors is to be ascribed to the multiplication of copies, as letters were more widely diffused; and to the diligence with which, as we have seen, new libraries were formed at Rome, and those of Alexandria again restored by Mark Anthony, and by the emperor Claudius. This latter city, indeed, having recovered from a temporary depression, became again, and continued for several centuries after the Christian era to be the chief seat of science and letters in the world; boasting such divines as Clement, Origen, Athanasius and Cyril—such mathematicians as Diophantus, Pappus, Theon, Proclus and others; among whom should be named Hypatia, a lady as remarkable for her beauty and her virtues, as for her science; which was such that she arranged astronomical tables, and illustrated with commentaries the Conic Sections of Apollonius, and the Algebra of Diophantus.

The last division of our subject, the *Byzantine* age, extends from A. D. 328 to 1453 of our era, a period of one thousand one hundred and twenty-five years. Though this long night of ages produced a multitude of authors whose works still remain, they are not such, as on the present occasion should engage our notice. The most

important amongst them are the Byzantine writers Procopius, Agathias, Cedrenus, Zonaras, Anna Comnena, Cinnamus and others; whose works, contained in thirty-six folios, constituted the principal source from which Gibbon drew the materials for his history. These times possessed, too, poets, such as Quintus of Smyrna, and Nonnus—grammarians and philologists, as Hesychius, Suidas, Gregory of Corinth, and Eustathius—ingenious romancers; some of whom, as Heliodorus, Achilles Tatius, Longus, and Xenophon of Ephesus, are distinguished even for the beauty of their style. One of the greatest men, and perhaps the most voluminous writer of this period, was St. John Chrysostom, the Demosthenes of the Greek church, as he has been styled by some, though critics think he should be compared rather with the Roman orator. Of him, and other fathers of the church, who lived in this age; as of those also, who, with the inspired writers of the New Testament, belong to the Roman age; and of the translation of the Seventy in the age preceding, I have declined all other mention, because of the extent and nature of the subject; which is not one to be dealt with in that hasty and superficial manner I of necessity adopt.

It may perhaps excite surprise, that those who treat this subject should descend in their conside-

ration of it to so low a period: and speak of Grecian literature as that of a living tongue, so late even as the middle of the fifteenth century. But it is notwithstanding true, that the subjects of the Byzantine throne were, even to this time, and in their lowest servitude and depression, possessed, as the historian of this period observes, of a golden key that could unlock the treasures of antiquity. Philelphus, giving a picture of the state of society in Constantinople; where he lived but thirty years before its fall; a picture somewhat highly colored we may suppose, by his Italian imagination, says, that those who had preserved their language free from the corruption of the vulgar tongue, spoke in ordinary discourse, even at that day, as the comic Aristophanes, the tragic Euripides, the orators, philosophers and historians of classic Greece —that all persons about the Imperial Court, and especially the noble matrons, had retained the dignity and elegance of the ancient tongue.

LECTURE III.

HISTORY OF

THE GREEK LANGUAGE.

HAVING in the preceding lecture glanced our eye over the wide field of Grecian Literature; in such way as to become sensible, perhaps, of its extent, rather than to form a true estimate of its rich and various productions; we shall now, according to our proposed plan, investigate the origin; trace the history; and consider the character of the Greek language, as spoken, or written in different ages, and by different states.

In regard to this language, if the Romaic be considered as in fact it is, a separate tongue; there is less necessity than in the case of most others, to distinguish between different periods of its history, because of important changes in its form. The wonderful permanency of the Greek language is not the least remarkable of the fea-

tures which characterize it. "A person," it has been observed, "from reading Xenophon may turn to Eustathius, who wrote in the twelfth century, that is, fifteen hundred years after, without being shocked with any corrupt alterations in the general manner of expression."

The varieties of this language depend less on time than they do on place and the nature of the composition; that is to say, the general language varies less from age to age than its several dialects do from place to place, in contemporary authors; or even from one writer to another, at the same place, but engaged in a different sort of composition, which had become appropriated to some one dialect.

We may, nevertheless, in our consideration of this subject, mark out three great periods; which are characterized, especially the first and second of them, by sufficiently distinctive features.

The first of these periods may be considered as comprehending those seven or eight centuries, that succeeded the earliest dawn of letters upon Greece, until the conclusion of th[redacted]war. The second, contains that comparatively short interval between the conclusion of this war and the reign of Alexander the Great. The third, will extend from the age of Alexander even to our own times.

During the first period the Greek language received its earliest cultivation, and, in some of its forms, attained the height of its perfection. We have no prose composition remaining that belongs to it; nor was any written until near its termination. Its literary character was exclusively poetical, and in the Ionic and Doric dialects, then chiefly cultivated, were contained the finest productions both of the Epic and the Lyric Muse. The five Epic, and the nine Lyric poets included in the canon of the Alexandrian critics, belong all of them to this period.

The second period presents us in the Ionic dialect with the first prose compositions; and in the Attic with the highest perfection both of verse and prose. In the drama, now first cultivated; in history, philosophy, and eloquence, this period, as it surpassed all ages that preceded it, so it left no hope of rivalling it, to future times. This age has been styled the Athenian, because during the whole of it Grecian literature was in a great measure concentered in Athens; where it shone in meridian lustre for the space of about an hundred and fifty years.

With the third period, as the wider diffusion of Grecian letters, so, it is thought, their decline too, began. Fine geniuses, it is true, illustrated the Alexandrian and the Roman ages; and a few

such appeared occasionally afterwards; lighting up from time to time the continually increasing gloom. But the brightest of them could boast only of a steady light; never extinguished wholly, but never dazzling with effulgence. And as Longinus asks, whether any man in his right mind would exchange that single tragedy, the King Œdipus of Sophocles, for all the works collectively of Ion; whom he has just before allowed to be a faultless writer; so might we affirm, that Sophocles, Thucydides, Plato and Demosthenes, outvalue all the poets, historians, philosophers, and orators of these later times.

But waiving, for the present, these remarks, let us proceed to what more properly forms the subject of the present lecture: an historical sketch of the language of Greece, rather than of her authors.

It would be tedious even to enumerate the books that have been written to investigate the origin, and trace the history of the Greek language—to point out its excellencies and beauties —to illustrate and explain its peculiarities—and to facilitate its acquisition. The language itself, no less than the works that are preserved in it, has been regarded as a creation of genius guided by philosophy, rather than as the fortuitous offspring of chance, reared and improved by use.

It has been described as a language "so musical and prolific that it could give a soul to the objects of sense, and a body to the abstractions of metaphysics;" as, "that wonderful language, which, formed amid migrations and revolutions of every kind, yet attained to such perfection as to make all subsequent languages appear nearly barbarous"—"so simple in its analogy, of such complex art in its composition and inflexion, of such clearness, force and elegance in its contexture, and of such singular harmony and majesty in its sound, as to bear away the palm from every other tongue." It must be evident, therefore, that the literature of Greece owes much of its superiority to the language in which it is contained; and consequently the argument derived from the existence of translations, against a study of the originals themselves, can have weight with those only to whom the originals are unknown.

Whatever national literature might be the subject of consideration, the language containing it would, necessarily, demand to share our notice; but this must be true in an especial manner of a literature, which belongs not properly to any one nation, age or country; but is preserved to us in a very admirable and peculiar language, ever varying though still the same in all its different forms, as spoken through a long succession of

ages, and over a vast extent of space, from the shores of Sicily and Gaul to the banks of the Euphrates; from the river Nile, to the northern borders of the Euxine sea.

The origin of the language of Greece is involved in the same obscurity with that of its first inhabitants. The learned of modern times have delighted to grope in a darkness, which the ancient Greeks themselves were unable to penetrate; but notwithstanding the additional lights afforded by a far more extended and various acquaintance with the languages and history of mankind, they have been unable to advance beyond probable conjectures. It seems right, however, to make ourselves acquainted with even the conjectures of the learned, in relation to a matter, which, if its importance shall be judged of from the number and ability of the pens that have treated it, must be pronounced a most interesting one; and which has, in fact, an interest, not only for the philologist; but also, and perhaps especially, for the historian; since radical affinities of language necessarily suppose the existence of other relations; and where historical documents are wanting, we may, by tracing back languages, investigate the origin of the nations using them, with greater probability than in any other way.

Instead of entering here into a minute detail

of the various opinions entertained as to the origin of the Greek language, let us proceed at once to a conclusion at which it appears all must arrive, who at the present day carefully pursue this investigation. This opinion, calculated to reconcile whatever might seem inconsistent in the rest, will serve as a clew to guide us through the mazes of an inquiry where we should, otherwise, be perplexed by the apparent variety and discordancy of sentiment; but, led by it, shall find at every step, new evidences of its truth.

This opinion, then, is, that the language of the Pelasgians, the earliest inhabitants of Greece, was either Sanscrit or a dialect closely related to it; and that the Greek language is the language of these Pelasgians, with such alterations as must of necessity have taken place during the lapse of so many ages, or have been introduced by Cecrops, Danaus, Cadmus and other colonists—that the Pelasgians, leaving their original abodes in central Asia, and carrying with them, of course, their language, spread themselves through the North of Europe, as well as into Greece and Italy, and planted their language wherever, after their wanderings ended, they happened to fix their residence.

This will explain the fact of so many Sanscrit words being found "imbedded," as has been ob-

served, in the Russian and in other Northern tongues. This will show the ground-work of those strange fancies maintained with such learned ingenuity in the Atlantica of Rhudbeck. Who does not derive the letters and religion only of the Greeks from his native country, Sweden; but discovers there, the Atlantis of Plato; the Ogygia of Homer; the Garden of the Hesperides; the Island of the Blessed, and the Elysian Fields. This hypothesis, moreover, assigns a reason for the radical affinities traced by Dr. Jamieson and others between the Greek and Gothic languages—this accounts for the striking resemblance pointed out by Bopp between the system of conjugation in the Sanscrit language and that in the Greek, the Latin, the Persic and the German. With this opinion are perfectly reconcilable those of Professor Adelung, and Dr. Marsh; or, to speak more correctly, their opinions seem of necessity to lead to this.[1]

[1] Professor Adelung thinks the Greek "can only have been immediately derived from the neighboring Thracians and Pelasgians; who seem to have come originally from the middle of Asia, through the countries north of the Black sea; and to have occupied part of Asia Minor, as well as Greece and Thrace." Dr. Marsh seems to differ only in supposing, that the Pelasgians crossed the Hellespont. And this is the opinion of Squire also, as maintained in his "Inquiry into the Origin of the Greek Language." Dr. Jamieson, in the dissertation prefixed to his Hermes Scythicus, proves very satisfactorily, from historical documents, the Scythian origin of the Greeks.

When, however, we speak of the opinions of the learned as all consisting with the one just stated; we must lay out of consideration certain hypotheses of a few individuals, which are either too paradoxical to obtain much credit, or else admit of easy refutation. Of the former sort is the fanciful, or as it has been styled by a late lexicographer, "fascinating theory" of Valckenaer and his followers; by which, if it were admitted, we should be spared the trouble of ascertaining from what external source the Greeks derived their language. This great philologist, whose doctrine shall be explained hereafter, would appear to have scorned the thought that Greek could be indebted to any other tongue; and to have believed, that it was in fact, as Lord Monboddo says one might suppose it to have been, invented by a nation of philosophers.

Among the hypotheses admitting an easy refutation may be reckoned that which derives the Greek either in great part or altogether from the Hebrew. The opinion of Salmasius and Vitringa, who would seek the origin of the Greek language partly in the Hebrew and Phœnician, and partly in the Scythian, Simonis holds to be more tolerable;[1] and we shall see reason to esteem it true,

[1] Simonis, Introd. Gram. Crit. in Ling. Gr. p. 7.

provided we allow to the Scythian much the larger share. This is the conclusion at which the learned Swede, Ihre, arrives; that the Gothic language is the sister, or rather the mother of the Latin and the Greek—that these three languages have a common origin; but that the Scythian or Gothic is oldest of the three—that Greece was originally inhabited by barbarians, that is, by Scythians; and that amongst them, therefore, as Plato in Cratylus and elsewhere expressly declares, we must look for the origin of very many Greek words.[1] There appears, indeed, to be the best authority for asserting, that between these two languages, the Hebrew and the Greek, there exists no radical affinity[2]—that the resemblance, whatever it may be, is confined to individual words; and that the traces of Hebrew observable in Greek are to be ascribed to Cadmus, or other colonists, who spoke some dialect of the former language; or to the commercial intercourse which the Phœnicians from the earliest times maintained with various parts of Greece.

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[1] Harles, Introd. in Ling. Græc. 1, 13. Schœll Lit. Rom. 1, 61.

[2] Squires' opinion to the contrary is not only at variance with that of Sir William Jones and others more competent to decide upon the matter; but is not the necessary result of his own facts and reasonings, which will consist as well with the opinion that the Pelasgi came from countries farther east than the Hebrews; as, in fact, we have good reason for believing that they did.

On this head the result of Dr. Murray's researches into the history and affinities of languages is the same with that more explicitly stated by Sir Wm. Jones; who thinks it may be incontestably proved, that the first race of Persians and Indians, the Romans, Greeks, Goths, and the old Egyptians or Ethiops, originally spoke the same language and professed the same popular faith; while, again, he believes it undisputed, and is sure it is indisputable, that the Jews and Arabs, the people who spoke Syriac, and a numerous tribe of Abyssinians used one primitive dialect wholly distinct from the idiom just mentioned. There are few to whom in a matter of this kind we ought to listen with greater deference than to Sir Wm. Jones; and he, as we perceive, holds it to be incontestible that the first race of Indians and the Greeks spoke originally the same language.— Now, the language spoken by the first race of Indians was probably Sanscrit: for that, we are assured, "is the parent of every vernacular dialect spoken by the civilized nations of Hindustan, from the snowy mountains of Thibet and Bhutan to the extremity of the Southern peninsula."[1] This radical affinity of the Greek with Sanscrit, from which Sir Wm. Jones inferred that the two

[1] Ed. Rev. Vol. 13, p. 368.

languages were in their origin the same, has both before and since his time engaged the attention of various learned men; and some have endeavored to account for it by an hypothesis which we shall not now consider; and which, indeed, seems little entitled to regard.[1]

It appears from the observations of Kleuker,[2] Fred. Schlegel,[3] Bopp,[4] and especially of Father Paulin de Santo Bartolomeo,[5] that this analogy between the ancient sacred language of the Bramins and that of the poets and philosophers of Greece consists, not in the resemblance of a few words (for such coincidences are often accidental); not in the names of warlike weapons, exotic plants, foreign wares, and such other things as often carry strange and imported words into distant regions; but is perceived in their grammatical forms; in elementary terms of primeval society; the names of natural and mutual wants, which

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[1] Ed. Rev. Vol. 13, p. 372. [2] See Schœll Lit. Rom. 1, 10.

[3] Essay on the Lang. and Phil. of the Indians.

[4] See Ed. Rev. No. 66.

[5] De Lat. Serm. Orig. et cum Oriental. Ling. Connexione. See also Fab. Biblioth. Græc. x. 100, De Græc. Ling. cum aliis linguis Symphonia. And for a list of many additional authorities upon this head, see "Historical Sketch of Sanscrit Literature," p. 45—48. Whatever proofs these authors furnish of the affinity of the Sanscrit with the Latin, may be regarded as equally demonstrative of its relation to the Greek.

spring up, and have their growth with society itself.

Having ascertained, then, from the internal evidence afforded by their language, the existence of some connexion, at some far distant period, between the ancient Indians and the ancient Greeks, let us now turn to the facts that history supplies to explain what this connexion was.

We learn from Thucydides and others that the first inhabitants of Greece led a wandering life, without any fixed abode;[1] and from this their mode of life it is supposed their name, Πελασγοί, (Pelasgians,) was derived.[2] But this same people, who from their way of life were styled Pelasgians, were also called Ἴωνες, or Ἰάονες, Ionians or Javans; a name, the origin of which, those who bore it were themselves unable to ascertain.[3] Some, with Herodotus, thought it derived from Ion, son of Xuthus; an opinion which Bochart and other learned writers have clearly shown to be unfounded.[4] Others merely say it descended to

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[1] Thucyd. Lib. i. c. 2.

[2] Jam. Diss. on Orig. of the Greeks, p. 36, 39—Strab. p. 221.

[3] It was not confined to the Athenians; but a name by which the barbarians designated all the Greeks. See Schol. on Aristoph. Acharn. v. 106—Hesych. Ἴαονα.

[4] Bochart, Phaleg, iii. 3. Simonis, Introd. in Hist. Gr. Ling. p. 5. Squires' Essay on the Origin of the Gr. Lang. p. 145.

them "from their ancestor, or from a king who once reigned over them." Thus, Greeks unacquainted with the sacred scriptures; but Josephus, when speaking of the settlements made by the several sons of Japheth, says, "from Javan, Ionia and all the Greeks derive their origin;"[1] and this Bochart declares to be the sentiment "of the ancients and the moderns all."[2] The sure ground, upon which this generally received opinion rests is the Bible; which teaches us, far more correctly than the Greeks themselves could do, who this ancestor of the Ionians was. In the tenth chapter of the book of Genesis we find Javan mentioned among the sons of Japheth, by whom "the isles of the Gentiles were divided in their lands, every one after his tongue, after their families in their nations;" and since in several passages of scripture,[3] Greece is in the original called Javan; an appellation which some modern translations have retained; the inference, considering the practice of the sacred writers, is unavoidable; that this country was originally settled by that son of Japheth from whom it derived its name.

That the language of these Pelasgian descendants of Javan differed materially from Greek, in

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[1] Joseph. Ant. lib. I. c. 6, p. 20. [2] Phaleg, col. 153, v. 38.
[3] Isaiah lxvi. 19—Daniel x. 20—xi. 2.

the earliest state in which this becomes known to us, there can exist no doubt; but from the expressions of Herodotus in relation to this matter we are not necessarily to infer that it was a wholly different tongue.[1]

The earliest form of the Greek language, as known to us, is found in the poems of Homer; or the Homeric poems, as of late years it has been thought more critical to style them. What is implied in this distinction we shall hereafter have occasion to consider. But before we inquire what this Homeric language was, it will be necessary to prepare the way by some remarks upon the dialects of Greece; which form a very peculiar feature in her written language. I say, in her written language, meaning to imply that the peculiarity consisted in the simultaneous existence of several written forms, distinguished for their respective excellencies—cultivated with like care —invariably appropriated to certain kinds of composition. Though several of the modern languages of Europe are spoken in a like variety of forms; yet choice or accident, the influence of a court, or of works of extraordinary genius, has generally confined the literature of each people to some one dialect.

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[1] Herod. i. 57—See Museum Crit. Vol. II. p. 234.

If Dante, Petrarch, and Boccaccio had had their birth at Venice, and cultivated their vernacular dialect, it would probably have been at this day, instead of Tuscan, the classic language of their country. The seat of the Spanish court at Madrid, and the writings of such men as Calderone, Lopez de Vega, and Cervantes confirmed to the Castilian its superiority over the other dialects of Spain. For a similar reason the language of the country North of the river Loire; the langue d'oil, prevailed over that spoken South of the same river, the langue d'oc; though the latter had been first cultivated. In Germany, the cultivation bestowed on the dialect of Misnia by the reformers of the sixteenth century has made it that of the general literature of their country. Our own language affords example of a distinction of dialects, which, to a certain extent, may illustrate that which obtained among those of Greece. The language of Allan Ramsay's beautiful pastoral may be called the Doric of the English tongue.

In Greece three principal causes tended to create and perpetuate these varieties of her language in its written forms.

First, the independence, and mutual rivalry of the several states; which between the Dorian and the Ionian tribes, especially, was to be traced

throughout their political institutions, their manners and customs, their language, and their literature. In the next place, the civil constitutions of the Grecian states made the richer and more cultivated classes of society dependent in great measure on the lower orders, and therefore more ready to adopt their modes of speech. And lastly, the existence in these dialects, while they were as yet altogether or chiefly oral, of the finest productions of poetic genius, caused to be retained afterwards, in a written shape, distinctions that were inherent in the form and structure of the verse.

We shall view this subject in its true light if we consider, that one and the same primitive tongue came to be spoken in different parts of Greece and her colonies; and by different tribes; with a great variety of modifications; which are commonly classed under one or other of four dialects; the Æolic, the Doric, the Ionic and the Attic; and these are again, with great propriety, reduced to two; the Doric and the Ionic—this two-fold division of the dialects of Greece corresponding with that of its inhabitants into those of Dorian and those of Ionian race; by whom, respectively, these dialects were used. The Ionian colonists of Asia Minor were the first to soften the asperities of the ancient ruder tongue, and to give it

consistency and polish. Their example was afterwards followed by Attica, their mother country. The Dorian colonists in Italy and Sicily seem to have been the first to cultivate their dialect to any great extent. The Æolian, departing least of all from the primitive form, continued to retain most traces of the rudeness and harshness of the ancient tongue; yet this was the language in which Sappho, Erinne, and Corinna sang. Anacreon struck his lyre to the softer sounds of the Ionian; esteemed most musical of all the four.

As out of one common language these four dialects by degrees arose; so each particular dialect in process of time underwent considerable change. It is obvious, however, that this must have been gradual; and that it cannot be easy to determine with accuracy the limits between old, and new; or old, middle, and new, for so they are distinguished. Every living language must be in a state of change; and though its motion be slow and imperceptible, yet, being constant, it produces in time very sensible effects.

As each of these dialects changed, from time to time, its general character; so did it also, at any given time, vary from place to place. And these varieties were called local dialects. The Grecian writers, however, seldom used with all its local peculiarities, the language of the particu-

lar place or people to which they happened to belong; but adopted, in greater or in less degree, the dialect of which their vernacular tongue was a local subdivision. Thus Pindar did not write the language spoken at his native Thebes; nor Theocritus that used at Syracuse; but they adopted, though in different degrees, the general Doric dialect of the period at which, respectively, they lived and wrote.

It is further to be observed, that writers living at the same time, in the same place, and making use of the same dialect, modified it variously, and adopted more or less of its peculiarities, according as the nature of the subject required them to descend to, or rise above the familiar phraseology of ordinary life. The dialect, moreover, in which an author wrote was not always that of his country, or that he was accustomed to employ in speech; but his choice was regulated by the nature of his subject; the place at which he chanced to be; or the persons whom he wished to gratify. Thus the same writer, perhaps, would use the Ionic-poetic dialect, as that of Homer has been called, if he wrote heroic verse; the Doric, in a pastoral poem; and Attic, if he attempted tragedy. The dialect of Pindar was not that of his fair countrywomen Myrtis and Corinna. Simonides of Ceos, who on other occasions used Ionic, when

at the court of Hiero, and writing for Doric patrons, adopts their dialect. Callimachus, too, when he writes at Argos, makes use of the dialect prevailing there; as in his hymn on the Bath of Minerva, and in that addressed to Ceres. Herodotus and Hippocrates, though both Dorians, adopt in their writings the Ionic dialect, because in that the earliest prose compositions were contained.

The choral parts of Grecian tragedy adopt in some particulars the Doric dialect; a fact for which, as yet, no reason altogether satisfactory has been assigned. But there have been different conjectures; as that, these Doricisms are traces of the original rusticity of the chorus—that they add to the language a certain dignity—that, the most eminent lyric poets having used the Doric dialect, it had, in consequence, become more appropriate to the lyric parts of tragedy. Since almost the only Doricisms are occasional substitutions of the letter α for the long vowels η and ω; and since the music of the choral parts was, as shall be shown hereafter, of a more impassioned character than that by which the dialogue was accompanied; and appears to have differed from it somewhat as the airs and choruses of the Italian serious opera do from the recitative; one motive for the adoption of the Doric dialect, in the limited extent just mentioned, may have been

that the letter α was especially suited to the musical divisions of the chorus; as the same vowel sound has by modern musicians been preferred to any other, for that same purpose of running their divisions. An ancient Greek writer upon music, Aristides Quintilianus, observes, that of the doubtful vowels, α is best adapted to melody; being, because of the broadness of its sound, most easily prolonged; and that of the consonants, which to avoid hiatus, must of necessity be united with the vowel sounds, the best is ρ.[1] We find him, therefore, pointing out as best suited to musical modulations the very syllable ρα, which is still a favorite with musical composers.

But to return from this digression. It was observed that a writer of heroic verse among the Greeks would adopt the dialect of Homer. It will be proper to extend somewhat our remarks upon this head. This dialect or language of Homer, which has been called Hellenic, was no one of the dialects we have been considering; but the common source of all. It was the language of the country and the age in which he lived; and because of his great excellence it continued to be that of poetry, especially of epic and heroic poetry, through all succeeding times. But though the

[1] Arist. Quint. De Musica, lib. ii. p. 92, 93.

language of Homer continued to be the language of that kind of poetry to which it had been consecrated by his use, it gradually ceased to be the tongue of any one people. Some terms and forms of words were retained in the dialect of one place or people; others in that of another. Some forms and modes of expression became obsolete, except in so far as they were retained in use by poets, in imitation of their great exemplar. These were called poetic licences; and characterized the poetic dialect. Of the ancient Homeric language each dialect preserved some part, that in the kindred dialects fell into disuse; and in after times grammarians spoke of such Homeric forms as being according to this or that dialect in which they were so preserved. And when it has happened that a particular word survived only in some single tribe, or state, we hear of the Bœotian dialect, the Cyprian, Pamphylian, Sicilian, Chalcidian, Cretan, Tarentine, Lacedæmonian, Argive, Thessalian and others. Hence we may discover the reason why

"Smyrna, Rhodos, Colophon, Salamis, Chios, Argos, Athenæ"

could all lay claim to the honor of having given birth to Homer. He used a language which had once been common to them all; but afterwards the language spoken at Rhodes and Argos was

called Doric; at Colophon and Chios the dialect used was Ionic; and at Salamis and Athens, Attic; distinctions in the tongue of these several cities that grew up amongst them after Homer's age.

Viewing the matter in this light we shall easily account for the difference of opinion between those who maintain that Homer was an Ionian; and call his dialect, Ionic-poetic; and those again, who think he was an Æolian, and that the basis of his language is Æolic. It will be evident that Homer, as respects his dialect, was neither Æolian nor Ionian; but used a language, which contained the germs of all those peculiar dialects that afterwards arose.

Until after the conclusion of the Persian war; or during the first of the periods before mentioned; the dialects chiefly cultivated were the Ionic, the Æolic, and the Doric; and in the first of these dialects, towards the close of this period, Grecian prose was first written; either by Anaximander, or by Cadmus of Miletus; or by a disciple of the former, Pherecydes of Syros, who, though commonly regarded as the earliest prose writer among the Greeks, died less than forty years before the battle of Salamis.[1]

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[1] Plin. H. N. v. 31—vii. 57. Schœll, Hist. de la Lit. Gr. I. 212.

During the second of our periods, or from the Persian war until the death of Alexander, the genius of Athens shone forth with such brightness as to throw into shade the literature of every other part of Greece; and the drama, history, philosophy, and eloquence, having been all brought to perfection in the polished dialect of Athens, it has to them, consequently, ever since remained appropriate—and upon the wide diffusion of the Greek language through the extensive regions over which Alexander's successors reigned, the Attic dialect, in consequence of the superiority of Attic literature, became the basis of the general language of composition; though certain kinds of poetry still continued to retain the dialect that had ever been appropriated to them. Athens, it is true, lost together with her political independence her literary pre-eminence; but her language still maintained its empire, even at the court of the Ptolemies; where Grecian arts and letters again revived, after their almost extinction during the wars that succeeded the dismemberment of the Macedonian empire.

But though Attic, or a more or less studied imitation of it, continued to be the language of prose composition; and was written in tolerable purity for many ages; nay, has been so written, occasionally, even to the present time, yet the spoken

language of Greece (of which the corruption began at an early period, but was probably much accelerated by the removal to Constantinople of the seat of empire) has finally undergone so great a change, that it should hardly be ranked, as by Simonis and others it is, among the dialects of the ancient tongue.

The Romaic, or κοινὴ διάλεκτος of the modern Greeks, derives its name from that of Constantinople; which under the Greek emperors was called Νέα Ρώμη, New Rome, wherefore the Greeks styled themselves Ρωμαίοι, and their language Ρωμαϊκὴ, Romaic. This language; itself divided into so many dialects that Cabasilas enumerates no less than seventy;[1] is thought by some to be one of the most barbarous of modern Europe; and such persons will of course deem it absurd to institute any comparison between Romaic and the parent tongue. Undoubtedly it is so if we take the modern language, as spoken with endless variety in the degrees of its corruption, by an ignorant and illiterate people, just emerging from a state of bondage; but it is fairer to judge of a language as found in the writings of well educated men. The Romaic, as written by Corai, and other learned modern Greeks, retains in its general features a

[1] Simonis, Introd. in Ling. Græc. p. 217.

much stronger resemblance to its parent tongue than the Italian does to Latin.

Since the Romaic, though rapidly advancing to the elevated station it will hereafter hold among the cultivated languages of modern Europe, is as yet scarce known amongst us, I shall endeavor to explain to you some of its peculiarities.

In the most striking features by which it is distinguished from the ancient Greek it resembles the languages descended from the Latin; which have varied from their original as to the same particulars.

The Romaic, for example, employs auxiliaries in certain tenses of its verbs. Thus with the imperfect of the verb ἔχω, *to have*, is formed the pluperfect of the indicative; as εἶχα γράψει, *I had written*—and the present and the imperfect of θέλω, *I will*, are used in the formation of several tenses; as θέλω γράψει, *I will write*[1]—ἤθελα γράψει, *I would have written.*

Nouns sometimes retain the same termination through several cases, distinguished only by the article; thus ὁ μάστορης, τοῦ μάστορη, τὸν μάστορη, ὦ μάστορη, *the master*, &c. This however is the vul-

[1] The expression is varied through eight different forms; as θέλω γράψει, or γράφει—θέλει γράψω, or γράφω—θὲ νὰ γράψω, or γράφω—θὰ γράψω, or γράφω—*I will write.*

gar usage; good writers varying the termination according to the case.

The modern language is without the middle voice of verbs; has no dual number, no dative case, and has lost entirely the infinitive mood; the place of which is supplied by a periphrasis. Thus instead of saying οὐκ ἠδύνατο ἀποχριθῆναι, the modern Greek would say δὲν εἶχε δύναμιν ν' ἀποχριθῇ. There is, indeed, one ancient infinitive still found in almost every sentence; but used in place of the third person singular and plural of the present tense indicative—thus, εἶναι φίλος μου, *It is my friend*—εἶναι μερικοὶ φίλοι, *there are several friends*. The following phrase will exemplify both these peculiarities—εἶναι καλὸν τὸ νὰ ἀποθάνῃ τις διὰ τὴν πατρίδα του, *It is honorable to die for one's country*.

The changes made in the syntax of the prepositions are important, since every sentence, almost, furnishes examples. Thus ἀπὸ governs the accusative instead of the genitive—ἔρχομαι ἀπὸ τὴν πόλιν. And με for μετὰ, in the sense of *with*, takes likewise an accusative.

Changes quite as great as these in the grammatical form of the language, have been introduced by alteration of the meaning of words retained from the ancient tongue—an alteration sometimes easily accounted for; but, in other cases, such that it is difficult to trace the steps by which it has

been brought about. It proceeds generally from the adoption of some secondary instead of the principal meaning of a word; or the substitution upon all occasions of one word for another, with which it chanced to be synonymous in some one case; or from extending, restraining, or otherwise varying, the meaning of ancient words without regard to that beautiful analogy, by which their signification was formerly determined.

All this may be rendered more intelligible by a few examples.

The Greek verb πομπεύω, which properly signified *to go*, or *to conduct one in solemn procession*, had the secondary meanings, *to strut*, or *carry one's self proudly, to subject one to derision;* and this last has become in the modern language its principal, or only sense; πομπεύω signifying *to expose to public ridicule, to slander, or defame*—πόμπευμα *public ridicule*—πομπευτής *a defamer*—πομπευτικός *defamatory, calumnious.*

Κάμνω signifies in ancient Greek *to toil, or labor; to perform with toil.* In Romaic it is continually used in the sense of our verb *to do;* as δὲν κάμνεις ἄλλο *thou dost nothing else;* or in that of the French verb *faire*, as κάμνει κρῦος *il fait froid*—κάμνει ζέστα *il fait chaud.* The word ἄλογος anciently signified *irrational, not endowed with reason or with speech.* In Romaic, τὸ ἄλογον means nothing but *a horse.*

The adjective ποντικὸς, which means in Greek, *marine*, or *of the kingdom of Pontus;* in Romaic signifies *a mouse*—perhaps because the mice of Pontus were remarkable, for Pliny speaks of *mures Pontici* as being white.[1] Disregard of the ancient analogy may be strikingly exemplified in the following words, found in both languages; but with considerable difference of meaning. From κολάζω, which properly signifies *to lop off*, *to prune;* but is chiefly used in the figurative sense, *to chastise*, *to correct;* descend these forms: κόλασμα, κόλασις, κολαστὴς, κολαστήριον, κολαστικὸς; which have their meanings according to an invariable analogy, to be explained hereafter; κόλασμα signifying *a chastisement inflicted;* κόλασις *chastisement*, that is, the act of chastising; κολαστὴς *one who inflicts chastisement;* κολαστήριον *a place of chastisement;* κολαστικὸς *fitted for inflicting chastisement*, having an active sense. Now in Romaic, κόλασμα means *damnation;* κόλασις *hell*, the place of torment; κολαστὴς *one who condemns;* κολαστῆρι (which by a usual abbreviation stands for κολαστήριον) *torment;* and κολαστικός *damnable*, in a passive sense.

I have endeavored thus to point out certain features of the modern dialect, which characterize it as the language of an unlettered people, and

[1] Hist. Nat. viii. 55.

especially distinguish it from the ancient tongue; but, marked as these features are, they do not strike us when, for the first time, we look into a Romaic book. The printed characters are Greek —the greater part of the words we recognize as Greek; in their outward form, at least; and if we merely glance our eye across the page, we may easily fancy we have taken up some ancient author; but the first sentence we read will, probably, teach us our mistake. And the apparent resemblance will be still further lessened, if we shall hear the sound of the modern language; so widely does it differ from the pronunciation we have been accustomed to associate with ancient Greek.

But, even while we are speaking of this language, it has ceased to be the same. The most ardent well-wisher of Greece could not desire her political state to improve more rapidly, than the modes of thinking and writing in that country actually do. Her authors borrow with such freedom from the Hellenic, or *literal* Greek, as the ancient tongue is called, words, phrases and modes of expression; and so studiously avoid, as far as possible, the corruptions of the modern dialect, that one of the latest and best grammarians of Romaic declares it impossible to say, in the present infant state of the language, where writers will stop in their endeavors to assimilate it to the ancient

Greek; or to draw between the two languages any precise line of demarcation.

This fact furnishes a new and cogent motive to the study of the Greek language. That the knowledge of it will not only admit us into those rich repositories, where the Romaic possesses the accumulated treasures of three thousand years to draw from at its pleasure; but will render us, with a few days' study, masters of a modern tongue, which, viewed in the light in which we thus place it, must be regarded as the most copious, and for purposes of political and commercial intercourse, will soon be esteemed one of the most valuable amongst those now in use.

Though the Romaic may boast some writers of considerable merit, it can scarcely be said, as yet, to possess a literature of its own. But the presses of Paris, Venice, and Vienna have, of late years, teemed with Romaic translations of good modern works; or with editions of ancient Greek authors, containing, in many cases, prolegomena and annotations in the modern dialect, by Corai and other learned Greeks.

Thirty years ago the language of the modern Greeks was by a learned critic, Hermann, declared to be worthy of their servitude; and so, perhaps, it was; as rude and barbarous as the nation was degraded; but now that they have, as we

may hope, burst their bonds forever, every thing authorizes the belief that their free spirit will, in this respect, as in others it has done, rise to an emulation of their ancestors.

Freedom, poesy, and eloquence have usually been seen to walk hand in hand; nor can we doubt but that among a people so ingenious as the Greeks; permitted to cultivate in peace their rare natural endowments; exulting in their newly acquired liberty; and with such subjects for history and song as their desperate struggle for it furnishes, there will soon arise authors worthy to commemorate such themes. When the physical energies of a people have been roused by foreign or domestic wars, or other powerful stimulus, it seems that there usually takes place a corresponding development of their moral and intellectual powers.

The brightest eras, therefore, in the literary annals of many states have immediately succeeded the most stormy and troubled periods of war and civil discord. The public mind retains the impulse it had received, but with a change of its direction; and the arts of peace flourish with a vigor proportioned to the dangers and difficulties from which the nation has emerged. Such we have reason from past experience to hope will be the case with modern Greece.

LECTURE IV.

ANALOGY OF THE GREEK LANGUAGE.

THE analogy of the Greek language, to be treated of in this and the succeeding lecture, is a subject upon which what I have to say would be more clearly understood if "submitted to the faithful sight." Addressing the ear only, I am afraid I shall hardly succeed in rendering myself intelligible, unless aided on your part by that attention, which the subject from its curiosity and its importance claims.

Of Grammar there is commonly a four-fold division made, into Orthography, Etymology, Syntax, and Prosody. The second of these heads, Etymology; under which are considered the modifications of single words; is by some, and perhaps more properly, called Analogy; which is defined to signify among grammarians, "the agreement of several words in one common mode."

The agreements or analogies to which especially we shall attend, are, that which prevails in the derivation of Greek verbs; that of their various inflexions; and that consistently with which verbal nouns are arranged in classes according to terminations which have certain meanings invariably attached.

Such analogies, no doubt, exist in every language; for although usage constitute the law, yet that usage is itself controlled by analogy. Which regulates custom in this respect as the mind does the motions of the body; a regard for it being so inherent that we find children and foreigners, speaking a language they are imperfectly acquainted with, almost always form analogically whatever words they ignorantly coin. But though a certain regard for analogy has been a natural dictate of reason, in the formation of all languages, yet in no other, perhaps, is it so constant and beautiful as in the Greek.

That you may understand the ground for this assertion, I shall proceed to an examination of three works relating to this subject, which are in the hands of few amongst us, though, as I think, so useful that they well deserve to be more generally known.

These three works are Valckenaer's Observations on the Sources of the Greek Language; Von

Lennep's Lectures on the Analogy of the Greek Language; and Cattier's Analogical Method. When speaking in my last lecture of the various opinions entertained as to the sources of the Greek language, I mentioned, among others, that maintained by Valckenaer. It is my intention now to attempt some elucidation of his doctrine. "This fascinating theory," as it is styled by Donnegan, is illustrated in the first of the works just mentioned, which is entitled "Observationes Academicæ, quibus via munitur ad origines Græcas investigandas, lexicorumque defectus resarciendos." These observations, though we viewed them before as containing a theory of the origin of the Greek language, may be properly classed with those other two works, of Von Lennep and Cattier, under the head of Analogy. Valckenaer treats of the analogous formation of derivative verbs—Von Lennep of the Analogy that prevails in the inflexion of verbs, and declension of nouns —Cattier of that according to which certain significations and certain terminations are invariably connected. Valckenaer was a pupil of Hemsterhuys; and these two eminent philologists were the authors of that doctrine, of which Wyttenbach, in the account he gives of his own studies, expresses his regret that he had not earlier enjoyed the light. Von Lennep, who was the pupil of

Valckenaer, as Valckenaer was of Hemsterhuys, asserts, that by the writings of these two, his predecessors, more light had been thrown on the analogy of the Greek language than by the labors collectively taken of all other learned men besides. These three writers lived at a period comparatively late; Hemsterhuys, the oldest of them, having died in the year 1766. Cattier's work was published so long ago as the year 1651, in Paris, of the Parliament of which city its author was a learned advocate.

To satisfy you that I do not overrate the value of this subject, when I say it merits to be attentively considered by students of the Greek language; and in the hope to obtain thus a patient hearing for what might else seem tedious; I will state the sentiments of Wyttenbach in relation to this matter. That learned critic, of the weight of whose authority I need not speak, takes occasion, in the preface to an historical collection which he published, to give his pupils, for whom that work was meant, an account of his own juvenile studies; and having spoken of his reading Homer, he exclaims, "Would that it had been without Schrevelius, whom following as my guide throughout, I adopted innumerable errors, which it afterwards required much time and experience to correct. Would I had at that time been ac-

quainted with the light of Hemsterhuys' Analogy, which, being now introduced into the schools of Holland, shines upon your path, so that you may hope to make greater progress, in proportion as your youth is more fortunate than was mine."

A translation of this account of Wyttenbach's studies was published many years ago in the 24th and 25th numbers of the North American Review; and, in a note upon the passage I have rendered, it is suggested that Wyttenbach probably objected to the *Latin* of Schrevelius' Lexicon. His objections, however, were of a more serious character, as, even from this passage, might have been inferred, by one acquainted with the analogy of which he speaks, and the ignorance and disregard of that analogy which Schrevelius evinces. But Wyttenbach has not left us to gather this by inference only, for in a previous passage of the same preface, speaking of a Greek lexicon edited by Ernesti, he observes that "the analytic part of it seems to have been left untouched, so polluted does it still remain with the dregs of Schrevelius' dulness." "In my opinion," he proceeds, "that lexicon will hereafter enable youths to acquire an intimate knowledge of the Greek language, which shall contain not only the words sanctioned by usage of the best authors, but the primitive and simple forms according to the Hemsterhuysian

analogy, together with the more extended ones derived from these, and finally those letters and syllables, by prefixing or subjoining which, nouns and verbs are augmented and assume new forms. Herein consists that wonderfully rich abundance of the language, which like soft and tender wax is capable of being moulded into every image of the mind; in which the primary form and signification of its words, conducted and modified through each variety every degree of meaning, still preserve throughout distinct traces of their origin."

The aim, which Wyttenbach here proposes to a lexicographer, is the one that has been kept in view by the authors of the three works I would recommend to your attention; and of the first of which, or that of Valckenaer, I proceed to exhibit a brief outline. The author begins by professing his belief that the greatest obstacle to the successful prosecution of Greek studies, arises from the defects of lexicons, whether ancient or modern; from their conducting the learner through tortuous windings, and intricacies of supposed anomalies, and from their failing to lay open the primitive form and signification of verbs. The supply of these deficiencies, he thinks, is rather to be hoped for than expected; nor could it be effected, he observes, unless by the combined exertions of many scholars through a long course of years.

As for himself, his purpose is, merely to suggest a few general remarks relating to the investigation of the sources of the Greek language—to scatter a few sparks, that may afford amidst the darkness a faint gleam of light—to tread in the path traced by Hemsterhuys; a *path* that shall hereafter become a *highway*, leading to the discovery of these sources—the recovery of almost lost primitives—a separation of the *proper* signification of words from the *figurative* and *metaphorical*—a repairing in some degree, of the defects of lexicons in use. He proceeds to state in as few words as possible, his observations; of which some of the more important are—that *simple* verbs among the Greeks were either *primitive*, or *derivative*—that of *primitive* verbs the number is exceeding small; while that of *derivatives* is almost infinite—that primitive verbs consist of two syllables; that these dissyllable primitives are composed of two, of three, or of four letters—that the *biliteral* primitives can, in the nature of things, be no more than five in number; ἄω, ἔω, ἴω, ὄω, ὔω —that the *triliteral* primitives are those which begin with a vowel; the *quadriliteral* those which begin with a consonant—that there are, however, a few verbs consisting of *five* letters, as to which it may be doubtful whether or not they are to be deemed primitives—that all verbs of more sylla-

bles than *two*, or more letters than *four*; or at the utmost *five*, according to the doubt just mentioned, are certainly *derivatives*, and to be referred, according to the laws of analogy, to the source from which they are derived. That to distinguish *primitive* verbs from others we must keep in view the simplicity of nature and of the early age; manifested in the formation of a very small number of primitives, by the skilful combination of a few letters, variously arranged. That, for example, there are in the Greek language some hundreds of words beginning with α; but among all this number, very few simple primitives; for except the verb ἄω, all other primitives beginning with α are triliteral. Of the three letters, however, which compose them, the middle one only can be varied; and since there were in the ancient alphabet only eleven consonants, there could have been no more than twelve primitives beginning with the letter α in the ancient simple tongue.

From the *triliteral* primitives, beginning with one or other of the five vowels that belonged to the ancient alphabet, Valckenaer proceeds to the *quadriliteral*; as to which he again remarks, that they begin with a consonant. So that whatever verbs of four letters have a vowel as the first, we may be assured are not primitives. Thus, he says, we may, by going through the letters of the

alphabet, easily represent to ourselves the ancient form and features of the language, and by calculation ascertain how many simple primitives were settled and determined by its first wise founders;[1] or how many primitive verbs it, in its earliest state, contained. The use of this observation, he remarks, although at first it may not be apparent, will be found in the sequel to surpass all belief.

From these primitives the most simple derivatives are formed by insertion of a single letter, whether consonant or vowel. From τίλω and τίγω, for example, are formed τίλλω and τίγγω—from πέρω πείρω and πέρνω—from ἄρω, αἴρω—from τύπω, τύπτω.

Another class of derivatives arises by the insertion of the five vowels each in order, so as to produce from each triliteral or quadriliteral primitive five derivatives; as, for example, from ἄχω are formed ἀχάω, ἀχέω, ἀχίω, ἀχόω, ἀχύω—from πέλω come πελάω, πελέω, πελίω, πελόω, πελύω. And from these derivatives again, by contraction of the first syllable, another set of verbs derive, as from πελαω, πελεω, etc. πλαω, πλεω, etc.

Vast numbers of new verbs descend from the simple derivatives in αω, εω, ιω, οω, υω. Thus from

[1] Quod probabiliter a primis sapientibus illis linguæ conditoribus simplicia fixa fuerint and constituta. Valck. Or. Gr. p 11.

each of the five first derivatives from ἄγω, a verb of frequent occurrence in both Latin and Greek, proceed various forms, as ἀγάζω, ἀγαίω, ἀγάλλω and ἀγαύω from ἀγάω; and so, in like manner, from the rest. It is to be observed, however, that derivative verbs in αω were most frequent; those in ιω, οω, υω, less numerous in the ancient language. Besides these verbs derived from the present tense, there are numerous classes of derivatives from other tenses, and especially from the future and the perfect. From the latter come those in χω and φω; from the former those in ξω, σκω, σσω, σθω, ψειω, σειω, ξειω. Multitudes of verbs moreover have their origin from nouns and particles.

We have, thus far, confined our attention to primitives, or to simple derivatives; but no language is more fertile of compound words than the Greek; of which it is the peculiar excellence and distinction, that it compounds and combines words in so admirable a manner as by means of one such compound term to express what in other languages can be conveyed only by a long periphrasis. Nor is it with verbs and nouns only that verbs are compounded; but with various particles, which retain in composition each its proper signification. Thus one simple verb may by its various combination with one, two or three of the eighteen prepositions, produce above an hundred

compounds. Valckenaer gives a list of fifty-two verbs compounded of βάλλω, with either one or two prepositions; the Greeks however did not limit themselves to the use of two only, but often prefixed as many as three to verbs.

It must be evident that, according to this theory, the riches of the Greek language and its possible extent are boundless; but we are not to suppose that the difficulty of acquiring it is increased in proportion to its copiousness. The harmony and order that pervade this vast extent; the strict analogy that reigns throughout its parts; the few sources from which the copious streams, that pour their riches through it are derived, render an acquaintance with it easy; and justify the assertion of Valckenaer, that "the Greek language is not difficult, and may soon be learnt by those who bear in mind that derivative verbs (for of primitives there are very few) are many, indeed, in number; but are derived, each from its primitive, according to the same rules."

Valckenaer compares the Greek language to an ample palace, richly stored with all things suited for ornament or use; containing many apartments, but each one of them constructed in like measure and proportion with the rest, and provided with like furniture and ornaments—to a garden, that delights by its simple and natural

beauties; adorned with a charming profusion of flowers infinitely variegated; a garden, which, though of wide extent, contains not many trees, and those planted in the most regular order; but spreading so widely their vast boughs and branches, as to overshadow the whole of the extensive space —trees, too, which differ from others, in that each trunk is like all the rest; that from each trunk the same number of branches spring, in the same directions, bearing the same number of leaves, having a perfect resemblance to each other.— That, accordingly, whoever shall have examined with curious and philosophic eye the foliage of a single branch, and the branches of a single tree, will have acquired thus a knowledge of all the leaves that weigh down every branch, of all the branches that spread forth from every tree.

As an encouragement to undergo the necessary labor; he observes, that though the study of all languages without exception, is at the outset displeasing and repulsive; yet that when resolute perseverance, sustained by a generous ardor has surmounted the first difficulties, and we are allowed to become acquainted with the sacred monuments of ancient times, we are blessed with a most plentiful reward.

It is true that to complete this perfect system of the language a multitude of words are wanting;

words no longer to be met with in the writings of the ancients; but this deficiency will not surprise any one who considers how vast a portion of ancient Greek writers has perished altogether—that not the one-hundredth part of them has survived the ruins of time to reach our day—that many words must have fallen into disuse in a long succession of ages during which Greek was a living tongue, prior to any written monuments of it now possessed by us—that consequently very many primitives anciently in use, are no longer to be found in books; but their former existence may be inferred, not only from analogy, but from the fragments of them yet scattered through the language, in derivatives from which by an unerring track we may ascend to these lost primitives.

To show by an example how we are to avail ourselves of the aid of analogy in restoring lost primitives, or their first derivatives, let us take the verb ἄρω *to fit, adapt, prepare.* This verb, which still exists in the language, gave origin, according to our theory to the five forms ἀράω, ἀρέω, ἀρίω, ἀρόω, ἀρύω. Of these five, there are only three now found in the books of the ancients, and in lexicons: viz. ἀράω, ἀρόω and ἀρύω. The ancient existence of the other two is inferred, not only from the analogy of the whole language, but from their derivatives, which still remain. For it is else-

where proved beyond a doubt that all verbs in σκω are formed from the future tense by inserting κ. The verb ἀρέσκω therefore is from ἀρέσω, the future of ἀρέω. And from this verb, too, the substantive ἀρεστὴ is without doubt derived. Again, the well known word ἀριθμὸς is, according to a clear analogy, derived from the perfect passive ἤρισμαι; but this ἤρισμαι could be formed only from the verb ἀρίω.

These five secondary forms, then, are shown to have been, at some period or other, all of them in use; and if their primitive ἄρω were no longer found, we might from them infer with certainty its former existence.

Let us apply this last observation in another case. The verbs ἀλάω, ἀλέω, ἀλίω, ἀλόω, ἀλύω all yet remain; and show by their resemblance, as well as by their kindred signification, that they are sisters, descended from the same parent stock,

> "facies non omnibus una,
> "Nec diversa tamen; qualem decet esse sororum."

But these sister verbs are scattered through the lexicons, their mother unknown, and their descent untraced. Can we doubt, however, that the verb ἄλω, from which they, according to our theory, derive their origin, was anciently in use; and that if no longer found in the language we should as-

cribe its disappearance to the lapse of ages and the great loss of books?

Lest it should be objected, that our inquiries are to little purpose, unless we can, when we ascertain these primitives, determine their signification also; and show moreover how their simple derivatives are related in meaning to each other, Valckenaer observes, that in the philosophic study of language there are two distinct subjects of attention; the external form of words, and their inherent signification, appropriate or varied through many figurative senses. A knowledge of the external form of words is of more humble nature; and may be acquired by a youth; that of their signification through all its varieties is more sublime, and can only be attained by one, who, wholly intent on this pursuit, has for half a century grown pale over the volumes of the ancients. While investigating the origin of verbs, then, with reference to their external form, we are not to suffer our attention to be withdrawn to their signification; nor attempt to settle that according to their origin; else we shall stumble and go astray at every step.

The last two and twenty pages of this work of Valckenaer's are devoted to an application of his theory in the case of the verb ἄχω, and its first simple derivatives, ἀχάω, ἀχέω, ἀχίω, ἀχόω, ἀχύω.

Neither this primitive, ἄχω, nor any one of these its five first derivatives are now found in lexicons, except only the verb ἀχέομαι.

Valckenaer undertakes to prove the former existence in the language of them all, by a numerous progeny of words, which yet remain; and which, according to the uniform analogy of the language, must have derived from them their origin.

Of these derivatives he has brought together an hundred, through all of which he discovers a certain resemblance in signification; that, to wit, of *sharpness*—the verb ακω having had, he thinks, the same meaning with the Latin verb *acuo*, found in Greek among its first regular derivatives.

To conclude—this analogical reasoning which leads to the discovery of lost primitives may be compared with that by which an architect is guided in his restoration of an ancient ruin. If he see a range of columns; interrupted here and there by intervals of double the usual space; and about them, scattered fragments of the same material; parts to all appearance of columns of the same size and order with the rest; he will with certainty infer that there once stood in these vacancies pillars like the rest; and, from examination of the fragments, and of the columns yet standing, he can easily determine what parts are wanting to complete the colonnade.

LECTURE V.

ANALOGY OF THE GREEK LANGUAGE.

HAVING in the preceding lecture considered the subject of analogy, as contained in Valckenaer's "Observationes Academicæ," I proceed now, in continuation, to explain the character of those other works, which were spoken of together with Valckenaer's, as having relation to this subject.

Von Lennep's Lectures, which next claim our attention, are entitled "Prælectiones Academicæ de Analogia Linguæ Græcæ, sive Rationum Analogicarum Linguæ Græcæ Expositio." They treat of the subject of Analogy in general, but dwell especially on that part of it which relates to the formation and inflexion of verbs. Previous to the publication of Von Lennep's Lectures, while

they were circulated in manuscript only, and in Holland chiefly, Villoison introduced them to the knowledge of European scholars generally, by a sort of abstract, which he gave in the notes to his edition of Longus, of Von Lennep's doctrine of the Greek verb. It was therefore that the edition of those lectures published by Scheidius after Von Lennep's death is dedicated to Villoison.

Von Lennep considers the simplest forms in the Greek language to be verbs consisting of the five simple vowels with the termination of the verb, i. e. ω added to them, as αω, εω, ιω, οω, υω; or with the termination μι, which he thinks more ancient, as αμι, εμι, ιμι, ομι, υμι. Of all which simple forms he undertakes to show, if not the actual, at least the former existence in the language. But, passing over this division of his subject, which he handles much as Valckenaer does, let us confine ourselves to a brief survey of his system of the Greek verb.

He observes, that as there are but three persons, so there are properly but three tenses; the *present*, the *future* and the *perfect*. These therefore were the tenses first invented and employed, and from them, accordingly, do we find nouns derived, and not from the other tenses of the verb; which are to be regarded only as degrees of these, adopted at a later period to perfect the language.

The future is formed from the present in the active voice of verbs in ω by inserting σ before ω, and the perfect by changing ω into κα. The terminations of the present and future are ω, εις, ει, ετον, εσον, ομεν, ετε, ουσι; those of the perfect α, ας, ε, ατον, ατον, αμεν, ατε, ασι. To these simple rules he makes all supposed anomalies conform. The second future falls under the same analogy; the tense improperly so called by grammarians being, in fact, a regular future, derived from some obsolete present tense of a kindred verb. Thus τυπῶ, λιπῶ, etc. are derived from τυπέω, λιπέω; of which the futures τυπέσω, λιπέσω, being pronounced by the Ionians τυπέω, λιπέω, were contracted by the Attics to τυπῶ, λιπῶ. So too both futures of the passive voice, both futures of the middle voice, and the tense called paulo-post-futurum, are all reduced to a single future passive, derived from different kindred forms of the same verb—τυφθήσομαι is from the active future τυφθήσω of the verb τυφθέω—τυπήσομαι from τυπήσω, the future of the verb τυπέω. In Aristophanes is found a future of another kindred verb, viz. τυπτήσω in Nub. v. 1445—τυπτήσεις in Plut. v. 21—and the passive τυπτήσομαι in Nub. v. 1382. This τυπτήσομαι might with the same propriety be called a third future passive, as τυπήσομαι a second; but this comes from τυπτέω, as τυφθήσομαι does from τυφθέω, and τυπήσομαι from τυπέω. In like

manner the future middle, as it is called, τύψομαι, is formed from τύψω, the future of the verb τύπτω; and the second future middle, τυπήσομαι, from the Ionic future τυπέω (for τυπέσω) of the verb τυπέω—from this Ionic future active being formed τυπέομαι, which the Attics contracted to τυποῦμαι. So likewise the paulo-post-futurum, τετύψομαι, is, in fact, the future passive of the verb τετύπω.

Thus all those five tenses, the two futures passive, the two middle, and the paulo-post-futurum, are reduced to one and the same tense—the future passive—and follow the same rule in their formation; but are to be referred to different kindred verbs.

And, as the second futures active and passive, with the two futures middle, and the paulo-post-futurum have no existence as separate tenses, unless in the imagination of grammarians: such is the case also with the second aorists active and middle; which are, in fact, imperfect tenses; the former of the active, the latter of the passive voice. And, in like manner, both the aorists, as they are called, of the passive voice are really imperfect tenses of verbs in μι. Thus ἔτυπον is an imperfect tense, related to τύπω precisely as ἐτύπτον is to τύπτω; and ἐτυπόμην, the supposed second aorist of the middle voice, comes from τύπομαι, as the imperfect ἐτύπτομην from τύπτομαι. The, so

called, first aorist passive, ἐτύφθην, is the imperfect of τύφθημι, just as ἐτίθην is that of τίθημι—and ἐτύπην the imperfect of τύπημι, as ἔθην is of θημί. For ἔθην, vulgarly called a second aorist, is, in fact, the imperfect of θημὶ, precisely as ἐτίθην is of τίθημι—and ἔστην is the imperfect of στημὶ, as ἵστην is of ἵστημι—ἔδων the imperfect of δωμὶ, just as ἐδίδων is of δίδωμι. For all these second aorists, as they are called, of verbs in μι, are, in truth, imperfect tenses, which belong to different kindred forms.

Thus much may suffice to show the manner in which Von Lennep has endeavored to introduce simplicity and harmonious order into the apparently complex system of the Greek verb; and to disencumber the language of those supposed anomalies, which the authority of grammarians has obtruded on it, and which only tend, as he observes, "studia per se plana et aperta impeditissima reddere."

Von Lennep's system has given great offence to many veteran grammarians; who are unwilling perhaps that a royal road should be made over steeps, climbed by themselves formerly with so much toil.

In exhibiting his doctrine divested of the copious illustrations and supports with which his ingenuity and learning have adorned and maintained it, I am sensible I do injustice to its merit; but we

have devoted to it all the time our limits will allow, and for any thing further I must refer you to the pages in which it is contained.

These theories recommend themselves strongly to the philosophic mind; being calculated to throw much light upon the origin and structure of the language, and greatly to facilitate its acquisition. But love of system has carried some, who have adopted them, to such extravagant lengths as to expose themselves to deserved reprehension for their abuse of an instrument very valuable in the hands of such men as Hemsterhuys, Valckenaer and Von Lennep; Ruhnken, Wyttenbach and Villoison.

I shall conclude this subject of analogy with a brief notice of Cattier's work; one of an humbler order than the other two we have examined, but, perhaps, more practically useful. It is confined chiefly to a consideration of the terminations of verbal nouns, and the meanings regularly attached to each, and is entitled "Gazophylacium Græcorum, seu Methodus Admirabilis ad insignem brevi comparandam verborum copiam." In the course of his little work the author exultingly describes it as "an admirable method, by means of which one may, within the space of an hour, commit to memory innumerable Greek derivatives; and in such manner as never to forget them,

provided only he have a thorough acquaintance with this method."

According to Cattier's plan the memory is to be assisted by first arranging the various forms of derivatives in their natural order, in the line of their descent; as for example οἶκος, οἰκέω, οἴκημα, οἴκησις, οἰκητὴς, οἰκητήριον, etc. and then associating with each individual form its appropriate and settled meaning.

As our time will not permit us to go through with a minute detail of Cattier's doctrine, I shall merely state the directions given by him for its use; the opinion of certain scholars as to its importance; and show how it is to be applied to some principal classes of derivatives.

Cattier bids you to assume a root, and varying its termination so as to produce new forms, adapt to each of these forms its own peculiar and constant signification. Thus, let the termination of the root be ος, we may have from it ια, εω, μα, μος, μιος, μη, μων, ις, ιμος, της, τηρ, τωρ, etc. to the number, if it be a fertile root, of eighty forms.

Suppose then we can learn within an hour fifty roots, and that they furnish, one with another, fifteen forms apiece; we shall have become acquainted with fifty times fifteen, that is to say, seven hundred and fifty words, and in such way, moreover, as not easily to forget them.

This treatise of Cattier's was republished at Utrecht in 1757 by Abresch, with some additions of his own; and he speaks of it as a work, which had till then been little known in Holland, but much sought after on account of its great utility —being one, which his own pupils, and all others who, previous to his republication had obtained from him transcripts of it, had found to teach them a method "qua insignis brevi verborum copia, vix voluntaria oblivione conterenda, comparari possit."

In England it was printed, for the first time, I think, in 1810; when there was published at Cambridge a posthumous work of Hoogeveen's—an Analogical Dictionary containing above seventy-five thousand Greek words, arranged according to their terminations, and accompanied by no explanation of their meanings. To this dictionary Cattier's Method is prefixed; in consequence, as I suppose, of the following mention of it by a son of Hoogeveen; who writing a preface to this his father's work, and speaking of the absence of Latin interpretations of the Greek words, (which he thinks his father omitted to give in order that the bulk and expense of the volume might be proportionably lessened) adds—"This defect, meantime, if such it should be called, the reader will have it in his power amply to supply by means

of a truly excellent little work of Philip Cattier, which contains, within the compass of five and twenty pages, if the additions made by Abresch be excepted, *The Treasury of the Greeks, or an admirable Method of learning in a short time a vast number of words.* The author of this golden treatise, which bears a somewhat exalted, but perfectly true title, lays down general rules applicable to the several terminations of words; which rules will enable him who knows them to attach at once to every word its genuine meaning, according to the sure law of Analogy. And he will then perceive the great utility of an analogical dictionary, which evidently rests on the same foundation, and of which he will no longer require an interpretation."

The great advantage to be derived from an acquaintance with this doctrine of Cattier's consists, not only in our being able by committing to memory a few hundred primitives to acquire such a stock of words as it would take years to gain in any other way; but, what is more, we shall form at once those clear and distinct ideas of their meanings which are to be derived only from such perception of the analogies of the language as is commonly attained by slow and imperceptible advances, during a long familiarity with its writers.

Cattier's "Method" may be illustrated by ap-

plying it to some of the principal classes of derivative nouns, and especially those which derive from the Præt. Perf. Ind. Passive.

From the first person singular of this tense we have nouns in μος, μη, μων, μα and μιος. Those in μος signify a performance of the action indicated by the verb; as κολασμὸς *a chastisement;* or something used in such action; as δεσμὸς *a bond.*[1]

Those in μη, not very numerous, signify some effect produced by the action of the verb; as γραμμὴ *a line*—δέσμη *a bundle.*[2]

Those in μων imply the possession of faculty or disposition to perform the action of the verb; as ἐπιστήμων *knowing, intelligent*—ζηλήμων *envious, jealous.*[3] The English terminations *full*, and *ant* or *ent*, and the Latin *ens* often correspond with this Greek termination.

Those in μα signify the effect of the action; or the thing about which it is employed; as στύγμα *a fold*—δόμα *a gift* (the thing given.)[4]

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[1] Other examples of this termination are διωγμὸς, ὄηγμὸς, στεναγμὸς, καθαρμὸς, μηκασμὸς, κρεμασμὸς, λογισμὸς, κελευσμὸς, πνιγμὸς, ἁρπαγμὸς, στηριγμὸς, ἰδιωτισμὸς, οἰμὸς, ἀθροισμὸς.

[2] So also μνήμη, σχισμὴ, τομὴ, χάρμη, οἰκοδομὴ.

[3] So also μνήμων, ἐπιλήσμων, ὀηλήμων, ἥμων, τλήμων, φράδμων, δαήμων, ἀλήμων, μεθήμων, σιγήμων, εὐρήμων, κεύθμων.

[4] As other examples of this termination may be suggested κρᾶμα, σκῶμμα, βούλευμα, μίμημα, τάγμα, φράγμα, πρᾶγμα, ποίημα, πάθημα, φόραμα, φόσημα, στίγμα, πρόβλημα, δόγμα, ἀξίωμα, αἴνιγμα.

Those in μιος have a passive signification, and denote some fitness or suitableness to the action of the verb; as σεβάσμιος *venerable*—ἐράσμιος *amiable*—γεράσμιος *honorable*—ἀκέσμιος *curable*. But these forms would, perhaps, be more properly derived from those in σιμος to be mentioned presently.

From the second person singular of the same tense are formed nouns in σις, ξις and ψις, which signify the action of the verb abstractedly considered; as νῆσις *spinning*—λέξις *diction*—βλέψις *seeing*.[1]

The Latin termination *io*, and the English *ion* and *ing* often correspond with this Greek ending, as they do also with the verbals in μος just now spoken of; but the Latin and the English languages do not distinguish as accurately as the Greek does between the action *generally* and a single performance of it; these verbals in σις, ξις and ψις expressing the former, as those in μος do the latter sense.

From these verbals in ις are derived substantives in ια and ιας, and adjectives in σιμος; as from αἴνεσις *the act of praising*; αἰνεσία *praise*—from σύνθεσις *the act of putting together*; συνθεσία *an agreement*—from θύσις; θυσιὰς *a bacchanalian*—from πόσις;

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[1] Other examples of this ending are φθίσις, φοίτησις, ἀνάλυσις, ζήτησις, ἄρνησις, ἄυξησις, κτῆσις, τήρησις, ποίησις, πρᾶξις, σύνταξις, τάραξις, κάμψις, κρύψις, μέμψις.

πόσιμος *potable.* These last have commonly a passive sense, and may be translated by the Latin verbals in *andus* or *bilis*, or the corresponding English ending *able:* as ἀρᾶσιμος *execrandus, detestabilis—execrable, detestable.*[1]

From the third person singular of the same tense are derived a great variety of nouns; of which those in της, της and τωρ signify the agent; one who performs the action indicated by the verb; as ταράκτης *an agitator, a disturber;* σβεστὴρ *an extinguisher;* ῥήτωρ *an orator.*[2] The Latin *tor*, and the English *er* and *or* correspond with these Greek terminations.

Those in τις, τρις, τρια and τειρα have a like signification with the last mentioned; but are of the feminine gender—as οἰκέτις, ὀρχηστρὶς, μαθήτρια, κοσμήτειρα.

Those in τυς signify the art of performing the action of the verb; as ἀκοντιστύς, κιθαριστύς, ὀρχηστύς, ἀγωνιστύς, τεκταστύς.

Those in τος commonly have a passive signification; and are adjectives applied to the objects of the verb's action; as αἱρετὸς *eligible,* αἰνετὸς *laud-*

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[1] Other examples are οἰκήσιμος, βρώσιμος, θύσιμος, γελάσιμος, αἱρέσιμος, ἐργάσιμος, θηράσιμος, πράσιμος.

[2] Other examples are ποιητὴς, ἀθλητὴς, πλανήτης, πειρατὴς, τρυγητὴς, ἀντλητὴς, τμητὴς, μαθητὴς, κλητὴρ, βαντὴρ, βαιστὴρ, πρηστὴρ, θυτὴρ, βοτὴρ, πατὴρ, ποτὴρ, κρητὴρ, κοσμήτωρ, διάκτωρ, κτίστωρ, δώτωρ, μηνύτωρ.

able, εὑρετὸς *discoverable*. These resemble the verbals in σμιος and σιμος already mentioned.

Those in ικος have an active sense; denoting ability to perform the action of the verb; or some relation to that action; as εὑρετικός *inventive*, πολεμικός *warlike*, κτητικός *skilled in acquiring*.[1] With this termination agree often the English *ical*, *like*, *ly*—as do the terminations *able*, *ible*, with the preceding termination τος.

Those in τηριος, τηρια, τηριον denote some efficacy in the subject; some aptitude to perform the action of the verb; as ὀηλητήριος *hurtful, deleterious*—ἀλεξητήριος *remedial*—θελκτήριος *soothing*. The feminine and neuter forms are used as substantives; as ἰξευτήρια *the art of taking birds* with ἰξὸς (τεχνη being understood); κολαστήριον *a place of punishment* (χωρίον being understood).

Those in τρος, τρα and τρον may be considered as derived from the last mentioned; and their feminine and neuter forms are, in like manner, used as substantives, and signify some instrument or thing, by means or aid, or in consideration of which the action is performed; as ἀκέστρα *a sewing needle*,

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[1] The force of these terminations in τος and ικος, the one passive and the other active, may be exemplified by contrasting the following words: ἀκεστὸς τακτὸς, αἰτητὸς, ποιητὸς, τμητὸς, δεκτὸς, διδακτὸς, καυστὸς, ζηλωτὸς, οἰκητὸς, πρακτὸς, πλαστὸς, θεραπευτὸς, κοσμητὸς, θεωρητὸς, and their opposite ἀκεστικός, τακτικός, αἰτητικός, κ. τ. λ.

ὀρχήστρα *the part of the theatre in which the chorus danced*, θέατρον *a place for the exhibition of a public spectacle* (χωρίον being understood)—φόβητρον, θήατρον, (χρῆμα or πρᾶγμα understood)—ἴατρον, δίδακτρον, μήνυτρον, λύτρον (ἀργύριον understood).

A few nouns in τρις signify one who acts from habit; as ἁλητρὶς *a sinner*—ἀντρὶς *a frequenter of caves, one who lives in caves.*

Of those in ος the neuter termination answers to the Latin gerund in *dum;* as ποιητέον *faciendum* —γραπτέον *scribendum.*

We have reason to believe that these analogous terminations were originally significant words in the primitive language whence they were derived, as are in the English language the terminations *full, less, like,* in *manful, manless, manlike, deathful, deathless, deathlike.* This last termination *like* seems, as well as the termination *ish,* to be the same with the Gothic *leiks,* the German *lich,* the Greek λικος, and the Latin *lis.* Thus from δοῦλος *a slave* comes δουλικός *servilis, slavish, slavelike.* In Greek, too, we may sometimes see the separate meaning of the termination. Adjectives, for instance, that end in ειδης, and adverbs ending in ηδον have their termination from εἶδος *a form, figure, appearance,* and may be translated by English words ending in *ical* or *like;* terminations probably related to each other. Thus πυραμοειδὴς *pyra-*

midical, pyramidal—σφαιροειδὴς *spherical*—κυλινδροειδὴς *cylindrical*—κυνοειδὴς *canine, like a dog*—κυνηδὸν *doglike*—λυκηδὸν *wolflike*—αγεληδὸν *herdlike*—μοσχηδὸν *calflike.*

To conclude; the student of the Greek language is to bear in mind, for his encouragement, that in proportion to the multitude of words thus analogically formed—and how vast that is may be judged of from the fact, that there are in lexicons between two and three thousand of that one class of substantives which end in μα—I say, in proportion to their multitude, is it rendered easy for him to retain the meaning of them all; for their perpetual recurrence impresses continually deeper and deeper on his memory that meaning, which in the case of all is determined according to one and the same simple rule.

LECTURE VI.

PRONUNCIATION OF

THE GREEK LANGUAGE.

In a preceding lecture I found occasion, when speaking of the Romaic or modern Greek language, to observe, that we have good reason to believe it differs in its pronunciation widely from the ancient tongue. I intend now to consider that subject more at large, but chiefly as it is involved in our examination of the ancient Greek.

A debate about the pronunciation of a dead language may be thought an idle one; but as nothing that concerns the Greek language has been considered by scholars unimportant, so the correct utterance of it has been a subject of much inquiry; and a difference of opinion on this head has ever since the revival of letters exercised the ingenuity of the learned. Nor would the questions that

have been raised in relation to this matter be altogether void of interest, though by the solution of them nothing were to be gained besides the gratification of a liberal curiosity respecting so noble a remnant as the Greek language is of ancient times; but since it cannot be taught without adopting some mode of pronunciation, it is desirable that this should be as much like the ancient as our knowledge will enable us to render it; or, at the least, be such as to consist in some degree with that harmony for which the ancient language, whether prose or verse, was famed.

The inquiry into this subject of ancient pronunciation has been twofold—first as to that of the letters, separately taken; and secondly as to that of syllables in relation to each other, and of words combined into sentences. The former may be called the *elemental;* the latter the *accentual* pronunciation.

The dispute as to the right pronunciation of the letters of the Greek alphabet, may be regarded as having been settled in the West of Europe for above two centuries. That which relates to the accentual pronunciation of the language is of somewhat later origin; and is perhaps still undecided. Such particulars as are necessary to a right understanding of the nature, origin, and present state of those controversies I proceed to mention.

It may without exaggeration be asserted that for several centuries previous to the fall of Constantinople the Grecian language was unknown in Western Europe.[1] It was natural, then, that those who learned Greek of the scholars driven by that event from their country, should adopt the pronunciation of their teachers; and also, that this pronunciation should continue for a time unquestioned. But in proportion as the learned became familiar with the writings of the Greeks, the persuasion acquired strength, that this pronunciation, which had been adopted at first without examination, was very different from that used among the ancients. For perceiving that "a language so noble and copious in composition, was in discourse so languid and effeminate, and so destitute of all variety and grandeur of sound," they naturally suspected that it must have been uttered in some other manner by those Greeks to whom

> . . . . . "dedit ore rotundo
> Musa loqui,"

And upon inquiry finding their suspicions, as they thought, confirmed; and having ascertained, as nearly as from the nature of the subject, their own learning, diligence, and observation they were enabled to do, what the pronunciation of the an-

[1] Simonis, Introd. Gram. Crit. in Ling. Græc. p. 29.

cients was, they endeavored, by their writings and their example, to reform according to that standard, the existing mode.

Among the earliest advocates of this reform were Aldus Manutius at Venice, Anthony Nebrissensis at Salamanca, Budæus at Paris, and Erasmus at Rotterdam; after whom, in consequence of the publication of his dialogue on pronunciation, the new mode was styled the Erasmian; as that to which it was preferred had been called the Reuchlinian, from John Reuchlin, a German, who having learnt Greek in Italy and France from the Greeks who had found refuge there, was among the first to introduce a knowledge of it into his own country.[1]

The Reuchlinian pronunciation was no other than that of the Romaic applied to the ancient Greek; and those who used it were called *Iotistæ*, because they gave the sound of the letter *Iota* to no less than six vowels and diphthongs. Those who adopted the Erasmian pronunciation were called *Etistæ*, from their new pronunciation of the letter η; the sound of which was, among the Reuchlinians, identical with that of ι, and had an important share in the controversy between the two grammatical parties.

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[1] Simonis, Introd. in Ling. Græc. p. 32.

The most obvious objection to the Reuchlinian pronunciation is the sameness of sound just now mentioned, and the consequent difficulty, in discourse, of discriminating many words, and understanding what is spoken. In answer to this it is urged, that words of the same sound, but differing in meaning, may be distinguished by the context. The objection, however, holds with some force against the expediency, at least, of the Romaic pronunciation. For if, even in English and other modern tongues, notwithstanding the more marked distinction of the vowels, there nevertheless occur in the infinite variety of their combination, similar sounds, which render the meaning doubtful; how much more frequently must this happen where six of the vowels and diphthongs are altogether, and universally the same.

It is not my intention to enter now into a detail of the rival modes of pronouncing. The subject cannot be properly treated within the compass of a lecture. Let it suffice, for the present, to observe that though the Reuchlinian pronunciation found warm advocates; and the contest between it and the Erasmian was zealously maintained for many years, as well in England as on the continent, it ended in so complete a triumph of the latter, that for the last two centuries the Reuchlinian method has been entirely laid aside, except

in its native country, Greece; or at the most has found in the West of Europe only here and there a solitary defender.[1] The pronunciation now generally adopted on the continent of Europe, differing in some particulars from that of the earlier Erasmians, agrees very nearly with that used by us.

But, while scholars, for the most part, agree, that the pronunciation of the ancient language according to the method of the modern Greeks is a very corrupt one, there are some at a loss to understand how this corruption had its origin, and proceeded to such length. Yet, if we consider what great alterations time alone can bring about; the many masters, and many forms of government which Greece has known since its conquest by the Romans; and the probable effect upon its language of that very event, we shall no longer find reason to wonder at any change, however great. No country was ever conquered, and for a long time governed by strangers of a different tongue, without some alteration of its own. Nor did captive Greece communicate to rustic Latium her arts, without losing at the same time somewhat of her polish.

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[1] Hobhouse's Journey, Vol. 2. p. 15. Herm. de Emend. Rat. Gr. Gram. p. 5.

One of the principal features of the modern pronunciation is its conversion of the diphthongs into simple vowel sounds; and it is not hard, perhaps, to indicate the source of this corruption. In most languages, the pronunciation of the diphthongs forms one of the chief difficulties for foreigners, and for the illiterate; who naturally tend, therefore, to change them into simple sounds. Thus we hear vulgar speakers pronounce oysters, point, boil, as if they were written iceters, pinte, bile. And the Scythian archer, introduced in the Θεσμοφοριαζ̈ουσαι of Aristophanes, gives to five distinct vowel sounds the same sound of ι, which prevails so in the pronunciation of the modern Greeks. The barbarians personated by this Scythian, and to whom the corruptions we speak of are, no doubt, partly due, found it difficult to discriminate the vowel sounds of a strange language, and therefore confounded several of them into one, that was more familiar to their ear, or more analogous to their own tongue. One principal cause, then, of the corruption we would account for may have been the negligence of an ignorant, semi-barbarous people, in regard to the vowel sounds of the language they employed, and their consequently sliding into a sameness of pronunciation. A like tendency being observable in the uneducated of our own and other countries, at the present day; and

a polite distinguished from a vulgar pronunciation especially by the greater accuracy with which it marks those unaccented vowels, that in the mouths of many speakers scarcely differ as to sound.

It must be borne in mind that those who argue against the pronunciation of the modern Greeks, do not deny to them the right of pronouncing in their own way their own Romaic, but dispute the propriety of extending this pronunciation to the ancient tongue.

When the modern Greeks assert their pronunciation to be that of the ancients, they should say, of what period. Antiquity is a term altogether relative; and considering it with reference to the Greek language and literature, we cannot well extend our view lower than the age of Dionysius of Halicarnassus, since even that is four centuries below the era of their highest glory and perfection: but the modern pronunciation cannot claim an antiquity as high as this, for Dionysius indicates very marked distinctions between vowels, which in the Romaic language are identical in sound.

The Greeks have enjoyed no peculiar means, nor used extraordinary pains to preserve their language from the changes to which every spoken tongue is liable, and which all have undergone. They speak it as it has descended to them through

successive stages of corruption; and had we not the books of the ancients to oppose to them, would perhaps assert its written form to be the same it was of old, merely because no precise period can be specified at which a change took place.[1]

The Erasmians, on the other hand, having first employed all means that learning and a diligent search into antiquity supplied, to ascertain what the pronunciation of the ancients was; surmounted the prejudices of education, and the force of habit to form their own accordingly; and though we cannot be certain they were entirely successful, yet there is little doubt that, of the Erasmian and the modern Greek method, the former approaches nearer to its prototype.

From the universality of the modern pronunciation throughout Greece, an argument for its antiquity has been derived; but since the important changes in the grammatical form of the ancient language are co-extensive with its modern pronunciation, we might in a like manner prove that the ancients had no middle voice; no dual num-

[1] A modern Greek, who published at Paris in 1825 a treatise entitled "Calliope, ou Traité sur la véritable Prononciation de la langue Grecque," actually does this as to many particulars; carrying the pretensions of his countrymen to a far more extravagant length than usual; but acknowledging the prevalence of the system of Erasmus "parmi le plus grand nombre des Hellénistes de l'Europe."

ber; no dative case; that they used two auxiliary verbs, but no infinitive.

The attention paid by modern Greeks to accent has been adduced as an argument in favor of their pronunciation; but this very care of accent to the disregard, as amongst them, of quantity is characteristic of other modern tongues besides Romaic. The harmony of ancient verse depended probably on a combined attention to accent and to quantity; but how the Greeks preserved regard for both, we at this day find it hard to comprehend; since the accentuation of their verse, according to the received marks, and to our idea of accent, seems in a great degree subversive of its measure. In later poets, both Greek and Latin, the gradual prevalence of accent over quantity has been observed by critics, until at last, in Romaic and Italian, we find accent superseding quantity altogether; and become, as in our own language, a principal object of attention in the structure of the verse.

The modern Greek versification, regulated by accent, without regard to quantity, and shackled by rhyme, bears, perhaps, about as much resemblance to that of classical Greek poets, as the modern pronunciation to the ancient. This exclusive attention paid by modern Greeks to accent has, indeed, been considered one chief cause of their vitiated pronunciation. And this leads us to

the second point in controversy; which relates, as was before observed, to the accentual pronunciation of the Greek language; one party maintaining that the accentual marks, as we have them in our copies of Greek authors, indicate the tones with which the language was anciently pronounced; that they can, and ought to be regarded in speech; and that such observance of them will consist with a respect for quantity; while the opposite party is of opinion, that the accentual system, as we have it is incorrect; that the ancients, had they marked their tones in speech, would have placed the marks on other syllables than those we find accented; or, at any rate, that if these marks are placed according to the rules laid down by ancient grammarians, they are not, by us, to be regarded in pronouncing Greek; seeing it is impossible to reconcile an observance of them with a due regard for quantity; upon which depends the measure and harmony of verse.[1]

The first person who seriously called in question the correctness of the present accentual system, was Isaac Vossius; who in a work "De Cantu

[1] Even Hermann concedes this. De Emend. Rat. Gr. Gram. p. 10. And Primatt, strenuous an advocate as he is for the use of accents, permits us nevertheless to read verse without regarding them, according to its measure. See "Defence, etc." p. 62, 128.

Poematum et viribus Rhythmi," published at Oxford in the year 1675, maintains, that the ancients placed the accent on long syllables; and that the present system of accents rests on no authority; there being no marks of accent found in any manuscript older than the seventh century. This opinion has found warm supporters, and violent opponents; and, since the arguments on either side fill entire volumes, it must be evident that we cannot here attempt a statement of them. A just idea of the merits of the controversy may be obtained, by those who wish it, from Dr. Gally's "Dissertation against pronouncing the Greek Language according to Accent," and Mr. Foster's "Essay on Accent and Quantity;" Dr. Gally's "Second Dissertation," in answer to Mr. Foster, and the latter's reply; all of which have been published together, in a single octavo volume.

An indifference to accents is evidently gaining ground; yet those who still insist on their importance, and who consider disregard of them a subterfuge for ignorance are generally of the more erudite; a circumstance which some account for by supposing these learned men reluctant to admit the little value of what it cost them such study to acquire. Meantime, since an acquaintance with them, if not absolutely necessary, is at least a part of liberal learning, I request your attention to a

few remarks on their origin; their place; their nature; and their use.

By their origin must be understood the origin of the marks used to denote them; for the tones themselves, or certain varieties of tone, existed always in the language; since "we cannot conceive of any language whatever that shall be wholly destitute of accent." [1]

The invention of the marks of accent has by some been carried back to Pherecydes, the preceptor of Pythagoras.[2] Others think it proved they were not used in Aristotle's time; because, from a passage in that author it appears to have been matter of dispute whether the ου in Homer's verse, Il. xxiii. 328, was οὐ *not*, or οὗ *of which*; and whether in Il. xxi. 297, διδομεν should be taken for δίδομεν *we give*, or διδόμεν (Ion. for διδόναι) *to give*.[3] Such doubts, say they, could have had no existence if accents had been marked. We are at liberty, however, to suppose, and must, indeed, infer from the passage just alluded to, as well as from others in the same work of Aristotle,[4] that

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[1] Herm. de Emend. Rat. Gr. Gram. p. 60.

[2] Simon. Introd. Gram. Crit. in Ling. Græc. p. 79.

[3] Arist. Soph. Elench. c. 4, (Vol. I. p. 284). See Græffenham. Comment. in Arist. Poet. c. 25, p. 208.

[4] De Soph. Elench. cc. 21, 23, (Vol. I. pp. 304, 306).

words were in speech distinguished by those different tones to denote which the accentual marks were afterwards employed.

A story related of Demosthenes would, in so far as it deserves credit, go to prove, if proofs were wanted, that accent was in his time a thing settled and recognized; although, possibly, the marks of it may not have been as yet invented. In his Oration for the Crown he charges Æschines with corruption, and appealing to the people to confirm his charge, asks them if Æschines was the hireling (μισθωτὸς) or the friend of Alexander, and then, turning to Æschines, he adds, "Thou hearest what they reply." Here, Ulpian, his commentator, tells us that he intentionally mispronounced the word μισθωτὸς, placing an accent on the first instead of the last syllable, in order that he might adopt the correction of the bystanders as an answer to his question.[1]

There are some who would bring down the invention of the marks of accent as low as the time of Cicero, or not long before; when the Romans first began to turn their attention to Greek literature, and some such notation was wanted to teach them the true pronunciation of the language.[2]

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[1] Dem. de Corona. p. 143. Edit. Morel. Paris. 1570.

[2] Port-Royal Gr. Gram. ix. 6.

The opinion, however, generally adopted is, that they owe their introduction to Aristophanes of Byzantium; who in the reign of Ptolemy Philadelphus had charge of the Alexandrian Library, and way the preceptor of Aristarchus.[1] But whatever may be the date of their invention, and whatever the rules handed down by grammarians for the placing of them, it is thought that prior to the seventh century they were rarely marked or visibly expressed; since none of the more ancient manuscripts or inscriptions exhibit any traces of them.[2]

Let so much, then, suffice with respect to the origin of these accentual marks. As for the place of them in Greek, grammarians have considered it; first as it is possible; that is, where they may be placed; secondly, as it is positive or determinate, i. e. where they actually are placed; and thirdly, as it is changeable, or varies conformably to certain rules. With respect to the first also, the possible place of accents, there are rules laid down; but for the positive, or determinate place of them, it can be learned, at least so far as primitives are concerned, from use only, and from lexicons. All this will be rendered clearer by examples. The possible place of the acute accent in Greek is upon either of the last three syllables.

[1] Montfaucon, Palæogr. Græc. p. 33. [2] Ibid.

Thus τετυφώς has it on the last; τιμάω on the penultima; and θάνατος on the antepenultima. The possible place of the circumflex accent is upon either of the last two syllables; thus, φιλῶ has it on the last, and πρᾶγμα on the penultima. The positive place of the accent is that to which the usage of authors has assigned it; and according to which the word is termed oxytone, as τετυφώς; paroxytone, as τιμάω; proparoxytone, as θάνατος; perispomenon, as φιλῶ; or properispomenon, as πρᾶγμα. But the accent is changeable, or varies its place according to certain rules; as when the word ἄνθρωπος, which is proparoxytone, becomes in the genitive ἀνθρώπου, paroxytone; because the last syllable is long, and the acute accent cannot be followed by two long syllables; but in the accusative case, ἄνθρωπον, the accent returns to the first syllable, because the last resumes its short quantity.

The right placing of the accents is a matter of far greater difficulty in Greek than in Latin; since, the quantity of the penultima in a Latin word being known, all that we need learn besides in order to accent it properly can be sufficiently expressed in very few words, while the consideration of this same subject, in relation to the Greek language, fills entire volumes of ancient as well as modern Greek grammarians.

This greater difficulty as regards the Greek proceeds chiefly from the necessity of considering the quantity, not of the penultima as in Latin, but of the ultima especially; which, varying with the cases and inflexions of the word, causes in the place of the accent a corresponding change. Other causes of embarrassment are the various accentuation of different dialects—the greater number of enclitics in Greek—the changes of accentuation in continued discourse, in consequence of the various combination and arrangement of words—and the extension of the use of accentual marks to express, besides the common syllabic or grammatical accent, that also which may be called the rhetorical or oratorial. Thus the various inflexions of the voice, by means of which a different sense is given to the same words—the same sentence, for example, rendered either affirmative or interrogative—are denoted in Greek by a different accentuation. In an interrogative sentence, the word that indicates the thing to which the question relates receives the accent that denotes the question.[1] This we should perhaps call *emphasis;* but the same thing in Latin is spoken of as an acute accent; an ancient grammarian observing that *quem* pronounced with an acute accent is

[1] Herm. de Emend. Rat. Gr. Gram. p. 93.

interrogative, and not a relative.[1] So in Greek also the pronoun τις is rendered interrogative by an acute accent. And this tone seems to be a dictate of nature, and will probably be found in every tongue. If one say in English *he whom nations honored*, and another ask *whóm did nations honor?* we cannot but perceive, that the word *whom* in the latter sentence, interrogatively used, is distinguished by a stress or tone of voice, which in the former it had not.

As to the nature of the Greek accents there has been much difference of opinion. Some have supposed they were musical marks. But it is objected, that music had its own marks, in characters formed from letters of the alphabet. Others maintain that they were metrical marks; to whom it is replied, that quantity likewise had its own appropriate marks.[2] Others hold with Isaac Vossius, that the accents anciently coincided always with the long syllables; that they were so placed until the seventh century; and that they are misplaced in any other manner. Others, again, think, that the acute accent indicates an elevation of tone, or a stress of voice, altogether independent of the length or shortness of the syllable it affects; or, to speak with more accuracy, wholly

[1] A. Gell. Noct. Att. vii. 2. [2] Mus. Crit. Vol. II. p. 64.

distinct from such quantity. And this opinion seems to be the least exceptionable. It may in fact be inferred from the mode in which a question was denoted by a peculiar accent, and especially from the rules laid down in relation to enclitics, that the Greeks meant by accent the same thing that we do; namely stress of voice; though when this stress falls upon a particular word, we commonly term it emphasis.

As for the enclitics so often mentioned by Greek grammarians, and which some regard as a mystery and great difficulty of the language, they are things with which, in use at least, every one who speaks English is familiar, although he may not distinguish them by an appropriate name. To show that this is so, let us take one or two examples. In the following sentence, "Anacharsis being asked how one might avoid intoxication—If, said he, he will observe what those who are intoxicated do," it will be perceived that the words *one* and *said he* have no stress of voice upon them; and the word *how* puts a question. Accordingly the words τις and φησι, corresponding to *one* and *said he*, are in the Greek original enclitics; that is to say, cast their accents on the preceding words, and the word πῶς *how*, has a circumflex accent, to denote that it is interrogative. Again; if one should say, *lend me your sword*, the word *me* would

be faintly sounded, and in Greek the word μοι, corresponding to it would be enclitic; whereas if the words, *lend it to me, and not to him*, were expressed in Greek, the word ἐμοί would be used, and with an acute accent.

It is probable, then, there was no difference between the Greek and the Latin accent as to their nature; although the rules by which their place was determined in each language differed. And this difference appears to have extended to verse as well as prose. For though we have good reason to believe that verse, whether Greek or Latin, was constructed with a regard for accent as well as quantity; and that its harmony was the result of both combined; yet what may have been the laws which determined in Greek verse the position of its accents, seems not easy to discover; while, with respect to Latin verse, this has been attempted with plausible success. It may be said, that the strict dependance of accent upon quantity produced necessarily a certain uniformity in the accentuation of verses of the same kind; but in some measures the disposition of the accents seems to be more regular than can be accounted for upon that ground. To become sensible of which, we need only recite the first two odes of Horace; regulating our pronunciation by the prose accent alone, without attending to the measure of the verse.

A comparison of the shorter kinds of Latin verse with verse of the same length in English, Italian, and other modern languages, of which the metre depends on accent, has shown that there exists between the Latin and the modern verse a general, and in some metres, an invariable agreement as to the places of the acute accent.[1] From these observations it has been inferred, that the metrical rules observed in the South of Europe are not entirely of modern invention; but are the old laws of accent, which have survived those of quantity.[2] But to return from this digression, and bring to a conclusion this head of our inquiry, it appears, that, as to its nature, accent in Greek, Latin and English is the same, except that in the two former languages it comprehends also that peculiar stress of voice, which in English we call emphasis. Nor need the threefold division of accent, which is commonly made by ancient grammarians, into acute, circumflex and grave, prevent our considering their accent as identical in its

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[1] Edin. Rev. Vol. VI. p. 384.

[2] Edin. Rev. Vol. VI. p. 376. The barbarous nations who overran those countries, and effected in the language as in every thing that belonged to them such important changes, found it easier to catch the *cadence* of the verse than to apprehend the difference between *long* and *short* syllables, and discriminate the delicate varieties in the vowel sounds of a strange language.

nature with our own. For this division is as applicable to our own language as it is to theirs; the acute accent being, in all of them, a greater elevation, force or stress of voice; the grave accent merely a negation of the acute, or a depression of one syllable as compared with another elevated or strengthened by the acute; and the circumflex a more prolonged stress in consequence of the length of the syllable which receives it, and therefore a downward inflexion of the voice succeeding its first elevation, or a grave accent following an acute.[1]

Finally, with respect to the use of the Greek accents; the difficulties which have been mentioned, with others that attend this subject, have led many scholars to adopt, too readily perhaps,[2] an opinion that the notation of them is of little use; and induced even eminent critics, who cannot be

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[1] Priscian (Op. Min. p. 159) reverses this order, and is perhaps equally correct. Sanctius in his Minerva (lib. i. c. 3) says "Servius antiquus grammaticus in Donatum, *gravem accentum in usu non esse* contendit. Ego quoque credo circumflexum periisse, et solum acutum vel quasi acutum remansisse." For authorities that may throw light upon and justify this view of the nature of accent, see Simonis, Introd. Gram. Crit. in Ling. Gr. p. 83, and the works there cited—Matt. Gr. Gram. p. 957, 8—Walker's Rhet. Gram. p. 132—Walk. Principles of Pron. § 486, seqq.

[2] See Herm. de Emend. Rat. Gr. Gram. p. 60—Sim. Introd. in Ling. Græc. pp. 80, 88.

suspected of ignorance of any thing that may be learned regarding them, to pronounce the whole doctrine which treats of them, useless and absurd.

Bentley speaks of "ratio hodie præpostera atque perversa Græcorum accentuum."[1] Brunck exclaims, "universam de accentibus doctrinam non assis facio."[2] Valckenaer, though he thinks them useful to "determine a variety of signification in words," is of opinion that no verse of a poet nor sentence of an orator should be read according to them.[3] And Dawes treats with contempt the idea of their being necessary to discriminate words; since that is much better effected by the context; and if the tenor of the discourse and the accents are at variance, we shall rather change the latter, than alter the context to suit it to the accent.[4]

Although, as was before observed, we have reason to believe that the ancients in their reading and speaking regarded both accent and quantity; yet since it seems to be commonly agreed that we are unable to do so at the present day, the question presents itself—How are we to pronounce Greek, since we cannot pronounce it as the

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[1] Epist. ad Mill. p. 82. [2] Anal. v. 3. Lection. et Emend. p. 13.
[3] Diatr. in Eurip. Frag. p. 247. [4] Misc. Crit. p. 75.

ancients did?[1] The general practice of England, in this respect, follows the Latin rules of accent, and

[1] Montfaucon (Palæogr. Græc. p. 236) having spoken of a manuscript in which all the accents; acute, circumflex, and grave; were noted indiscriminately with a single mark, proceeds —"Qui porro usus accentuum fuerit in vocali pronunciatione, et qua ratione syllabarum quantitatem et accentuum inflexiones veteres conciliaverint, nondum ita perspicue explanatum est." Perhaps this difficulty arises in great measure from a propensity to confound accent with quantity, and to suppose that stress or elevation of tone necessarily produces length of time. Which is so far from being true, that, in fact, the antepenultimate accent in our own language naturally shortens the vowel upon which it falls. (Walk. Prin. of Eng. Pron. § 535.) English prosodians, however, generally, confounding quantity with accent, speak of English verse as Iambic, Anapæstic, Trochaic, etc. when they should describe it as composed in each case of a certain number of syllables, with accents disposed according to established rules. Mr. Foster, who insists upon the general coincidence of acute accent and long quantity, (Essay on Acc. and Quant. pp. 25, 38, 40) and thinks "this has probably been the occasion, that accent and quantity have been confounded together by numberless persons," shows in his own case how naturally such false premises lead to such erroneous conclusion. He observes that "Very often in English the vowel before a consonant seems to derive its length from the vowel following it as in *bite, write:* which without the final vowel is short, *bit, writ,*" (p. 22.) But afterwards, (p. 35) he calls and marks as trochaic the verses

Vītăl | spārk ŏf | hēav'nlў | flame:
Quīt, ōh | quīt thĭs | mōrtăl | frame.

Here the first syllable of *vital* and the word *quit* are marked as long: being, as Mr. Foster thinks, the first syllables of trochees. But though the *i* in vital is long, like the *i* in *bite, write;* the *i* in quit is undoubtedly short, as the *i* in *bit, writ.*

In music we find it easy to distinguish tone from quantity, and know well that an acute or loud tone is not necessarily long, nor a grave or low one necessarily short. If we hear sung the

the greater part of German scholars do the same;[1] and since this is a simple method, of easy application, and sanctioned by the practice of Germany and England, we may feel ourselves justified in conforming to it our pronunciation. It remains, then, to ascertain what the Latin rules of accent are. Cicero observes, "Ipsa enim Natura, quasi modularetur hominum orationem, in omni verbo posuit acutam vocem, nec una plus, nec a postrema syllaba ultra tertiam."[2] Quinctilian, having spoken of the more difficult observance of accent among the Greeks, says, "apud nos brevissima ratio, namque in omni voce, acuta intra numerum trium syllabarum continetur, sive hæ sint in verbo solæ, sive ultimæ; et in his aut proxima extremæ, aut ab ea tertia. Trium porro, de quibus loquor, media longa, aut acuta aut flexa erit; eodem loco brevis, utique gravem habebit sonum, ideoque positam ante se, id est, ab ultima tertiam, acuet. Est autem in omni voce utique acuta, sed num-

words "God save great George our king," we can readily perceive that the word George is pronounced *long* and *low*, the word king *short* and *high*.

[1] Valpy's El. of Gr. Gram. p. 168. Primatt's Defence, etc. p. 422. Buttman's Gr. Grammar, p. 15. Simonis, Introd. in Ling. Græc. p. 80—88. Herm. de Emend. Rat. Gr. Gram. p. 60.

[2] Orator. c. 18.

quam plus una, nec ultima umquam; ideoque in dissyllabis prior."[1]

These laws of accent, delivered by Cicero and Quinctilian, are comprised by Sanctius in the following verses.[2]

"Accentum in se ipsa monosyllaba dictio ponit,
Exacuit sedem dissyllabon omne priorem,
Ex tribus extollit primam penultima curta,
Extollit se ipsam, quando est penultima longa."

They may be stated from ancient grammarians somewhat more fully thus:

Monosyllables if long by nature, take a circumflex; as â, ê, ôs, oris, flôs; if short, or long only by position, an acute; as spés, ós, ossis, fáx.

Dissyllables and polysyllables have a circumflex on the penultima when long by nature, and followed by a short syllable; as Rômam, flôris, Românus. Otherwise, dissyllables have an acute upon the first; as hómo, péjus, párens.

Polysyllables have their accent on the penultima when long; as paréntes, Aráxis; but on the antepenultima if the penultima be short; as máximus, últimus, dóminus. The enclitics, que, ve, ne, throw their accent on the syllable that immediately precedes them.[3]

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[1] Quinct. Inst. Orat. lib. i. c. 5, 29. [2] Sanct. Gram. Lat. p. 18.

[3] For a more particular statement of these rules, and also of the few exceptions to them, see Priscian. de Accentibus;

These, then, are the rules which, with an exception relating to Greek verse presently to be noted, we apply to the accentuation as well of Greek as Latin; and we may find our excuse for so doing in the fact, that the Romans themselves preferred, in speaking Greek, to use their own Latin accentuation; that is, they applied to other dialects of Greek the accentuation of its most ancient form, the Æolic, which bore a close resemblance to their own.[1]

That the nature of the exception just now alluded to may be more clearly understood, I shall preface the statement of it with some general remarks on the correct method of pronouncing verse.

Perhaps no better general rule can be proposed for both Greek and Latin, than that laid down by Walker for reading English verse; "to give it the measured harmonious flow of sound, which distinguishes it from prose, without falling into a bombastic chanting pronunciation, which makes

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Opera Minora, p. 157—Sanct. Min. lib. i. c. 3—Maxim. Victorin. p. 1942—Donat. p. 1740—Vossii Aristar. lib. ii. c. 9, 10—Port-Royal Lat. Gram. v. ii. p. 354, seqq.

[1] Thus the word ποταμὸς which in later dialects is oxytone, was in the Æolic dialect proparoxytone πόταμος; and was pronounced with that accent by the Romans, as it is now by us. Consult on this subject Athen. lib. x. c. 24—Olympiodorus as cited by Bentley de Met. Terent. sub finem. and the numerous authorities referred to by Foster in his Essay on Accent and Quantity, p. 44—50.

it ridiculous;" [1] and since this medium is not easily observed; and we ought here, as in other like cases, to avoid the worse extreme; he thinks "it will not be improper before we read verse with its poetical graces, to pronounce it exactly as if it were prose;" giving to every syllable the same accent, and to every word the same emphasis it would have in prose. For though the rhythmical arrangement of the accent and emphasis is all important in poetry, yet, "if this arrangement tends to give an emphasis to words which would have none in prose, or an accent to syllables which have properly no accent, the rhythm or music of the verse must be entirely neglected."

A like rule is adopted by Bentley [2] in regard to Latin verse; the writers of which, he thinks, endeavored to avoid placing the metrical stress upon the last syllables of words, in opposition to the genius of their language; which never accents a final syllable except when followed by an enclitic. He condemns therefore a mode of reading Latin verse, which violates the laws of accentuation delivered by Cicero and Quinctilian, in marking with a stress even final syllables, when in such position that according to the nature of the verse they might receive one. To explain more clearly

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[1] Rhet. Gram. p. 152, 155. [2] Σχεδίασμα de Metris Terentianis.

what manner of reading he approves, he cites the first verses of the Æneid; marking the accented syllables.

'Arma virúmque cáno Trójæ qui prímus ab óris,
Itáliam fáto prófugus Lavínaque vénit,
Lítora; múltum ille et térris jactátus et álto,
Vi súperum saévæ mémorem Junónis ob íram.

And he observes, that one who reads these verses skilfully, and with the proper modulation, will pronounce them as they are here marked by accents; and not like schoolboys, laying a stress upon the beginning of each foot.

'Italiám fató profugús Lavínaque vénit.

The general rules that have been laid down for reading English and Latin verses, may, *mutatis mutandis* be applied to Greek verse also. The harmonious flow of either, may, without falling into a monotonous chant, be rendered sensible by laying a peculiar stress wherever the usual syllabic accent and the metrical ictus happen to coincide, as it does, for example, in nine of the twelve feet which compose these two hexameters.

'At si cúm referétque diem condétque relátum,
Lúcidus órbis erit, frustra terrébere nímbis.

And this coincidence of the ictus metricus with the common prose accent will take place in Greek in many cases where in Latin it cannot; that is to say, upon the final syllables of words; and it is

in such cases that the exception above mentioned will be rightly made. For our use of the Latin accentuation in reading Greek verse can be justified on no other ground than that of our inability to reconcile the Greek accents with the metrical structure of the verse; so that where these accents consist with, and support the modulation of the verse, as they do in the above cases, there is no reason whatever for neglect of them, even though placed on final syllables. Since that, however opposed to the genius of the Latin language, is perfectly consistent with the accentuation of our own.

My meaning may be rendered plainer by examples. In the following verse,

Εἰ δὴ ὁμοῦ πόλεμός τε δαμᾷ καὶ λοιμὸς Αχαιούς,

the last syllable of πόλεμός, having the accent it derives from the enclitic τε united with the ictus metricus; and the last syllables of ὁμοῦ and δαμᾷ, in virtue of their circumflex accent, together with the same metrical stress, should be strongly marked in reading; and so, for a like reason, should the last syllables of three words in the following iambic verse,

Θεοῦ γὰρ χωρὶς οὐδεὶς εὐτυχεῖ βροτῶν,

Where θεοῦ, εὐτυχεῖ and βροτῶν should be pronounced

as they are written, with a circumflex upon their final syllables.

Sometimes, as in the following verse,

Σπεῖσον ἐμῇ σποδιῇ, σπείσόν μοι, οἰνοποτῆρι,

the metrical stress and the accent will coincide in every word; but this happens oftener still in shorter measures, such as

Ῥόδα, τοῖς ὁ παῖς Κυθήρης
Στέφεται καλούς ἰούλους,

where the ordinary accents agree perfectly with the modulation of the verse, even according to our apprehension of this matter.

THE END.